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(6.54)

STRUCTURAL STABILITY AND SOLVENT DENATURATION OF MYOGLOBIN

Herskovits, Theodore I., and Helene Jaillet (Department of Chemistry, Fordham University, New York, N.Y. 10458) Science 163, No. 3864, 282-285 (January 17, 1969)

Three-dimensional structures of sperm-whale myoglobin and other proteins have been obtained in fairly complete detail by X-ray crystallography; such structures indiof proteins and nucleic acids in solution has been reported by several researchers The importance of hydrophobic interactions for altering the native structure over the past decade. The effects of various structurally related denaturants on fectiveness of structurally related denaturing agents (such as amides, ureas, alphobic interactions. The present report concerns the denaturation of sperm-whale that control native structure as well as lead to a better understanding of hydrocate the location of the various amino-acid side chains. A knowledge of the efthe conformational stability of deoxyribonucleic acid have also been reported. cohols, and glycols) on these proteins should clarify the nature of the forces

show the denaturation transition of the reagent--increases as the chain length and 50-percent change in the particular experimental feature that has been chosen to myoglobin by solvents.

The denaturing effectiveness on sperm-whale myoglobin of 31 water-miscible alcohols and glycols, urease, and amides--judged in terms of the denaturation midpoint, that is, the molar concentration of denaturant required to produce a

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COMMERCIAL FISHERIS ABSTRACTS VOL.  $22\,$  no.  $12\,$  page. I united states department of the interior, fish and wildlife service.

Abstracter:

L. Baldwin

(Department of Biochemistry, Medical College of St. Bartholomew's LIPID PEROXIDE FORMATION IN MICROSOMES CENERAL CONSIDERATIONS

Hospital, London E.C.1, England)
The Biochemical Journal 113, No. 2, 315-324 (June 1969)

Separated nuclei, mitochondria, lysosomes, and microsomes of liver form lipid peroxides after incuba-Lipid peroxides (measured by the thiobarbituric acid method) are formed in tion, but apparently the quantity and rate of lipid peroxide formed in the microsomal fraction are much greater than in the other fractions. homogenates of many different tissues after incubation.

membrane damage, and they have been, in fact, implicated in damage to mitochon-Lipid peroxides may be an important factor causing, or a stage in, general drial membrane, the erythrocyte membrane, the lysosome membrane, and the endoplasmic reticulum of liver cells by carbon tetrachloride.

of lipid peroxide, and because peroxide formation may be important in the over-He paid special attention to NADPH (reduced made a detailed study of the factors affecting, and possible mechanisms of, the In view of the capacity of the microsomal fraction to form large quantities all metabolism of endoplasmic reticulum or its destruction in vivo, the author process in the microsomal fraction. He paid special attention to NADPH (reducnicotinamide adenine dinucleotide phosphate)-induced peroxidation as this may

be linked to microsomal hydroxylation. The author concludes that the results are in agreement with the concept that the electron-transport chain of the microsomes normally concerned with hydroxy-lation can be switched to oxidize unsaturated lipids of the endoplasmic reticulum and that this oxidation produces lipid peroxides. The ascorbate supplies

(over) COMMERCIAL FISHERIES ARSTRACTS VOL. 22 NO.12 PAGE 1 (OV UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

F. T. Piskur Abstracter:

LIPID PEROXIDE FORMATION IN MICROSOMES. THE ROLE OF NON-HAEM IRON

The Biochemical Journal 113, No. 3, 325-332 (June 1969)

Because the microsomal fraction of liver readily forms lipid peroxide on inascorbate, it is likely that inorganic (nonhem) iron is an essential component cubation with NADPH (reduced nicotinamide adenine dinucleotide phosphate) or

The present paper reports on a study of the role of inorganic iron as a catalyst or as a part of a catalytic system for the peroxidation of unsaturated

not form lipid peroxide on incubation with ascorbate or NADPH unless Fett is added. in a low concentration is added subsequently. No other metal ion can replace the somes of rat liver (prepared from homogenates made in pure sucrose) are incubated inorganic iron. Microsomes prepared from sucrose homogenates containing EDTA do phenanthioline, or desferrioxamine] inhibit lipid peroxide formation when micro-Formation of lipid peroxide in microsomes prepared from sucrose is stimulated to agents do not form peroxides on incubation unless inorganic iron (Fe<sup>++</sup> or Fe<sup>+++</sup>) a small extent by inorganic iron but to a greater extent if adenine nucleotides, with ascorbate or NADPH. Microsomes that were treated with metal ion-chelating Metal ion-chelating agents [such as EDIA (ethylenediaminetetraacetate), 0-The iron in normal microsome preparations exists in hem and in nonhem forms. containing iron compounds (as a contaminant), are added.

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F. T. Abstracter: LIPID PEROXIDE FORMATION IN MICROSOMES.
RELATIONSHIP OF HYDROXYLATION TO LIPID PEROXIDE FORMATION

The Biochemical Journal 113, No. 2, 333-341 (June 1969) Wills, E. D.

NADFH (reduced nicotinamide adenine dinucleotide phosphate) as a source of elecoperation of a microsomal electron-transport chain (Siekevitz, 1966; Ernster and trons (Brodie, Gillette, and La Du, 1958), and the oxidation is a result of the The process requires The microsomes of the liver are the site of oxidative metabolism of many aromatic compounds, steroids, and drugs (Williams, 1959).

rapid production of lipid peroxide, and it appears that the two processes of peroxidation and hydroxylation are closely linked and may be the result of the operation of the same electron-transport chain. In the present study, the author made an attempt to determine the role of lipid peroxidation in the hydroxylation Orrenius, 1966). Wills (1969) found that when microsomes are incubated with NADPH there is a process.

From the results, the author believes that the two processes of hydroxylation esses probably depend upon the same electron-transport chain, and peroxide formation (involving membrane disintegration) may be part of the normal membrane reand lipid peroxide formation in microsomes are closely linked. The two procmodeling process.

[8 figures, 6 tables, 15 references]

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12 PAGE 1 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

F. T. Piskur Abstracter:

Ackman, R. G. (Halifax Laboratory, Fisheries Research Board of Canada, Halifax, Nova Scotia), M. Kates (University of Ottawa, Ottawa, Ontario, Canada), and R. P. Hansen (Department of Scientific and Industrial Research, Wellington,

Biochimica et Biophysica Acta, Lipids and Lipid Metabolism 176, No. 3, 673-675

terrestrial animals and appears to be functional only in a few special cases such Pristane (2,6,10,14-tetramethylpentadecane) is a trace component in fats of

diastereoisomers of pristanic acid formed by random terminal oxidation of pristane culated through various trophic levels as they are in the aquatic animals. Any

Fats and lipids in terrestrial animals are not continuously recir-

resulted in Schiff base formation. In the present study, the researchers examined further the interaction of aliphatic primary amines, such as amino acids and n-hexylamine, with malonaldehyde to produce N,N'-disubstituted l-amino-3-iminopropenes and investigated their spectroscopic properties.

The amino acids or their esters and n-hexylamine react with malonaldehyde to yield conjugated Schiff bases. These Schiff bases show characteristic absorption They assumed that the reaction of the aldehyde and the amino groups of the protein pletely insoluble in LM NaCl and show a marked increase in mechanical strength. boxypeptidase A, when reacted with glutaraldehyde (a dialdehyde), become com-

The au-

in the ultraviolet and visible regions of the spectrum. [7 figures, 2 tables, 25 references]

trast, branching of the hydrocarbon part of the denaturant, increasing the hydroxyl content, or blocking of the functional amino groups of the amides and the ureas by alkyl substitution reduces the denaturing power.

[2 figures, 1 table, 30 references]

of the disorganization of the hydrophobic interior of this protein.) In con-

hydrocarbon content increases.

(in which the iron may be linked to phosphate) appears to be essential for both the

ascorbate system and NADPH system that catalyze lipid peroxidation in microsomes.

[1 figure, 7 tables, 13 references]

origin, where such fats do not reflect a diet rich in fatty acids of marine origin [3 figures, 18 references]

[Abstracter: F. T. Piskur] and DDD pristanic acids as the methyl esters are valid for fats of terrestrial isomers other than LDD and DDD and postulated that the ratios determined for LDD thors found the LDD/DDD ratio for sheep fat menthyl pristanates to be 0.70, whereas the ratio for methyl pristanates was 0.67. They observed no diastereorived from phytol, to an extent comparable with the aquatic environment. therefore, are not as likely to accumulate, relative to those more directly de-

[Abstracter: F. T. Piskur]

[2 figures, 9 references] and homologous haptens.

ten. Different degrees of immobilization are noted between cross-reacting haptens different degrees of immobilization when bound with a homologous spin-labeled hap-The antibodies isolated with homologous and cross-reacting antigens yield anistropic ESR spectra of the antibody spin-labeled hapten complexes.

of the spin-labeled hapten-antibody complex spectra as a criterion for structural or orientational variations within the antibody active site. ( $A_{max}$  is the maximum splitting between the high and low field peaks of the anisotropic ESR spectra Ko~108) of the anti-DNP antibodies was used to advantage to obtain well-resolved tween the spin-label and the hapten, that could be used to study different antiof the spin label in units of gauss.) The authors aimed to prepare a series of homologous and cross-reactive spin-labeled haptens, with identical linkage bebody populations. The high affinity (average intrinsic association constant of previous studies (Whitaker, 1964) on changes in postmortem skeletal muscle, muscle is tender initially, becomes tough, then becomes tender again. when cooked at an intermediate time before aging is completed. Apparently, the the sulfhydryl-disulfide composition of the muscle. This research note reports the authors postulated that postmortem changes in tenderness may be related to broilers is more tender when rapidly cooked within a few minutes postmortem than Koonz et al. (1954) and de Fremery et al. (1963) found that the muscle of

trations in excised chicken breast muscle during the first 6 hr. postmortem (muscle was packed in plastic bags and aged in ice). Average concentration of sulf-There were no significant changes in total or nonprotein sulfhydryl concen-

the structural heterogeneity of rabbit anti-DNP antibodies (anti-2,4-dinitropheny)

antibodies). The authors made use of the variation in maximal splitting (Amax)

In this study, ESR (electron spin resonance) spin-labeling was used to probe

Hsia, J. C., and L. H. Piette (Department of Biochemistry and Biophysics, School

Archives of Biochemistry and Biophysics 132, No. 2, 466-469 (July 1969)

of Medicine, University of Hawaii, Honolulu 96822)

SPIN-LABELED HAPTEN STUDIES OF STRUCTURE HETEROGENEITY AND

CROSS-REACTIVITY OF THE ANTIBODY ACTIVE SITE

a nonhem iron complex. [8 figures, 7 tables, 33 references]

normally reduced by NADPH, at the site of

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DERIVED FROM MALONALDEHYDE AND AMINO ACIDS

SYNTHESIS AND CHARACTERIZATION OF THE FLUORESCENT PRODUCTS

sity of California, Davis 95616) Biochemistry 8, No. 7, 2821-2827 (July 1969) Chio, K. S., and A. L. Tappel (Department of Food Science and Technology, Univer-

Dialdehydes can react bifunctionally with proteins to give inter- and intra-molecular crosslinking. Quiocho and Richards (1964) found that crystals of car-

DURING POSTMORTEM AGING SULFHYDRYL CONTENT OF EXCISED CHICKEN BREAST MUSCLE (This denaturing power could be expected in view

Caldwell, K. A., and Hans Lineweaver (U.S. Department of Agriculture, Research and Development Division, ARS, Albany, California 94710)
Journal of Food Science 34, No. 3, 290-291 (May-June 1969)

on results of tests designed to determine whether sulfhydryl groups are involved in these early postmortem changes.

was no correlation between sulfhydryl concentration and rigor or tenderness of hydryl was 1.34  $\mu$ moles per mg. nitrogen for the total sulfhydryl content and 0.61  $\mu$ moles per mg. nitrogen for the nonprotein sulfhydryl content. Apparently there the chicken muscle. [I figure, 10 references] [Abstracter: F. T. Piskur]

electrons at a point along the chain,

F. T. Piskur

Abstracter:

EXTRACELLULAR NUCLEASE ACTIVITY OF FISH SPOILAGE BACTERIA, FISH PATHOGENS, AND RELATED SPECIES (0.38, 2.03) vvski, A. Y., and R. E. Levin (Department of Food Science and Technology, University of Massachusetts, Amherst 01002)

Applied Microbiology 17, No. 6, 787-789 (June 1969)

time fish had been stored in ice. The autolytic reaction involved is: adenohas been proposed as an index of quality of fish. Recent studies considered the ability of the predominant species of bacteria involved in fish spoilage to dedegradation of inosine monophosphate to hypoxanthine as an index of the length sine triphosphate → adenosine diphosphate → adenosine monophosphate → inosine monophosphate - hypoxanthine. Practically no data have been published on the The measure of the extent of nucleotide degradation in the tissue of fish grade polynucleotides.

All strains of  $\underline{P}_*$  putrefacions produced deoxy- Of the remaining 87 organisms, 23 produced riborescent pseudomonads that were isolated from haddock, and 34 related organisms. 13 produced deoxyribonuclease. The organisms that produced deoxy-The authors demonstrated the production of extracellular deoxyribonuclease and ribonuclease by 23 marine and 3 dairy strains of <u>Pseudomonas putrefaciens</u>, 15 strains of fluorescent pseudomonads pathogenic to fish, 38 strains of fluoribonuclease also produced ribonuclease. ribonuclease and ribonuclease. An agar-plate method was used.

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Abstracter: F. T. Piskur

BY RAPID SPECTROPHOTOFLUOROMETRIC METHODS IDENTIFICATION OF BACTERIA

Health Service, Bureau of Solid Wastes Management, U.S. Department of Health, Education, and Welfare, Public Health Service, 222 East Central Parkway, Cin-Charles J., and Thomas C. Purcell (Consumer Protection and Environmental

Environmental Science and Technology 3, No. 8, 764-766 (August 1969) (American Chemical Society, 1155 Sixteenth Street, N.W., Washington, D.C. 20036) cinnati, Ohio 45202)

revealed to identify certain bacteria. In the present study the authors attempted accurate classification and identification. Previous workers (Willox and Shewan, 1963; Norris, 1964; Cann and Willox, 1965) separated the esterases of bacteria by starch gel electrophoresis and used the characteristic enzyme patterns that were Additional characteristics of microorganisms are needed to facilitate their They determined the carbohydrate content and esterase activity, and calculated to develop additional characteristics that might be used to identify bacteria. technique might be used in the rapid identification of bacteria isolated from the esterase/carbohydrate (E/C) ratios of several species of bacteria. polluted waters.

Bacteria of the following species were examined: <u>Staphlococcus</u> 237, <u>S. hemo-cus</u>, <u>S. 227</u>, <u>Escherichia coli, Streptococcus <u>faecalis</u>, <u>Strep, hemolyticus</u>,</u>

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Abstracter: F. T. Piskur

(9.11)

ACTINOMYCETES IN NORTH SEA AND ATLANTIC OCEAN SEDIMENTS

(Institut für Meeresforschung, Bremerhaven, Germany) No. 5208, 858 (August 23, 1969) Nature 223, Weyland, H.

parts of the North Sea and the English Channel. The findings are tabulated below. ing up these results, he examined sediments collected at 107 stations in various Followtaken from the Weser estuary and the German Bight; he found more in samples of the author found few heterotrophic bacteria in samples of water bottom sediment that had been incubated for from 4 to 6 weeks at 18° C. In 1966,

	Collection point of samples	f samples	No. actinomycetes found	cetes found
Depth	Characteristics	Location	Range	Mean
meters			no./cm.3	no./cm.3
30-69	sand	English Channel	92-1,485	510
435-690	silt	Skagerrak	23-1,458	164
48-235	various	Central N. Sea	23-115	54
76-164	various	Northern N. Sea	23-230	128
	0	verall	23-2.909	

Similar results were obtained from an analysis of sediment samples taken at depths of from 25 to 3,362 m. off the coast of West Africa at distances up to 175 nautical miles. Although fewer colonies developed on pour plates for these

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12 PAGE 3 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

IN COMMERCIAL FRESHWATER CRAYFISH (GENUS PROCAMBARUS) INCIDENCE AND GROWTH OF SOME HEALTH-RELATED BACTERIA

Abstracter: L. Baldwin

Lovell, Richard T., and John A. Barkate (Department of Food Science and Technology, Louisiana State University, Baton Rouge 70803) Journal of Food Science 34, No. 3, 268-271 (May-June 1969)

million pounds. In 1966, the State of Louisiana licensed 34 crayfish processing plants. For many years crayfish were marketed alive, and the consumer boiled the (1) to determine the extent of occurrence of certain health-related bacand toxin production of pathogenic organisms in crayfish flesh and formula foods crayfish products have appeared on the market. But, there is no information in The present paper reports on a study of the microbiology of the crayfish. The study had two objec-The commercial catch of fresh-water crayfish in 1965 in Louisiana was 8.6 crayfish before he ate them. Now, hand-peeled tail meat and precooked frozen teria in crayfish products from commercial sources and (2) to determine the patterns of growth of certain fecal indicator organisms and the patterns of the literature on the microbiology of crayfish as a food. containing crayfish.

Fresh-water crayfish samples were collected from 22 sources representing the major commercial areas in Louisiana. The samples were analyzed for coliforms, Escherichia coli, fecal streptococci, coagulase-positive staphylococci, Salmonella,

and <u>Clostridium botulinum</u> type E. Coliform organisms, E. Colif, fecal streptococci, coagulase-positive Staphy-lococci, <u>Salmonella</u>, and <u>C. botulinum</u> type E were found in 100, 92.6, 94.1, 3.0, COMMERCIAL FISHERIES ABSTRACTS VOL.  $22\,$  NO  $12\,$  PAGE  $_3$  (OVEE) UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

British Patent 1,154,079

Stauffer Chemical Co. (U.S.A.) (pat.)
B.F.M.I.R.A. Abstracts 22, No. 8, 415, Abstract No. 1603 (August 1969)

phate groups into foods such as fruit juices, beer, refrigerated dough, wine, potatoes, animal feeds, eggs, fish, and poultry is said to reduce bacterial spoilage in the foods. Incorporating polyphosphates having chain lengths of between 16 and 34 phos-[Abstracter: L. Baldwin]

From the 1,348 strains of actinomycetes isolated from marine sediments, Nocardia, Micromonospora, Microbispora, and Streptomyces were identified. About half the strains developed aerial mycelia in pure culture. Since colonies derrived from different samples often grew best on different culture media, the authat the actinomycetes found are part of the marine ecosystem--not merely random microorganisms could be detected by use of milliliter samples, he also concluded thor concluded that a variety of physiological strains or species was present. Because a high percentage of the samples yielded actinomycetes and because the individuals or temporary survivors of terrestrial runoff, [1 table, 2 references]

mycetes. Samples taken 175 miles offshore at a depth of 3,362 m. yielded 23 actinomycetes per cm.<sup>3</sup>; those taken 40 miles offshore at a depth of 299 m. yielded 136 per cm.<sup>3</sup>. than on plates for the North Sea samples, 9 of the 12 sediments yielded actino-

### OXYGEN ELECTRODE CHAMBER FOR BIOLOGICAL SUSPENSIONS

Rikmenspoel, Robert (Department of Biological Sciences, State University of New York, Albany 12203)

Analytical Biochemistry 30, No. 2, 292-295 (August 1969)

diffusion of oxygen rates and, therefore, permits the measurement of respiratory rates of 2  $\mu$ M O<sub>2</sub>/min. with better than 10 percent accuracy over a measuring time of 2 min. [3 figures, 5 references] [Abstracter: F. T. Piskur] suspensions. In this snort note, the author presents a retinement of the curve described by Chappell (1961). This more refined cuvet shows low noise and back-The oxygen electrode is used to measure the respiration rate in biological In this short note, the author presents a refinement of the cuvet

C. botulinum type E produced toxin in all three substrates within 48 to 72 hr. at 30° and after 33 days at 5° C.; toxin was not produced in the substrates at 56 days in ice-pack. The pH of the raw flesh and cooked flesh increased during extended storage (30° C.) to above 8.0 and the toxin became inactive. The pH of the commercial-type product decreased during extended storage (30° C.) to 5.7 and the toxin remained active. When the pH of the commercial-type product was adjusted to 8.5 with NaOH, the toxin was inactivated. [4 figures, 3 tables, 14 references]

3.0, and 0 percent, respectively of the samples analyzed. Staphylococcus aureus and Salmonella typhimurium grew well in all three of the substrates (raw flesh, and 37° C. Streptococcus faecalis and possibly E. coli showed reduced growth in the raw flesh, but both grew well in the cooked flesh and the commercial-type product. None of the last four organisms mentioned grew at 5° C.

### ANTAGONISTIC EFFECT OF MONOVALENT CATIONS IN MAINTENANCE OF CELLULAR INTEGRITY OF A MARINE BACTERIUM

De Voe, Irving W., and Evelyn L. Oginsky (Department of Microbiology, University of Oregon Medical School, Portland 97201)

Journal of Bacteriology 98, No. 3, 1355-1367 (June 1969)

water and in salt solutions, relation between monovalent and divalent cations in the maintenance of the inments on lysis of a marine bacterium, the present authors noticed an antagonistic workers attributed this lysis to osmotic factors alone. Apparently, factors other MacLeod (1965) found that gram-negative marine bacteria undergo lysis when transferred from sea water to low ionic environments. Harvey (1915) and other tibility of the marine bacterium, designated isolate c-Al, to lysis in distilled tegrity of the cell envelope of the organism. This paper reports on the susceplysis of marine bacteria and of an extreme halophile. During a series of experihave showed that lower concentrations of Nat and Lit are required to prevent than osmotic pressure contribute to the lytic phenomenon, inasmuch as studies

cations and Mg++ for electrostatic interactions with components of the cell enmarine bacterium is probably due to the competition between specific monovalent From the findings, the authors conclude that the lytic susceptibility of the

velope of the organism.

[16 figures, 3 tables, 26 references] [Abstracter: F. T. Piskur]

<u>faciens</u> might be used as a criterion of identity for members of such species of fish spoilage bacteria. [1 figure, 2 tables, 11 references] The authors suggest that the production of deoxyribonuclease by P. putre-

## PHYSICAL STUDIES OF LIPID-LIPID AND LIPID-PROTEIN INTERACTIONS

Chapman, Dennis (Unilever Research Laboratory, The Frythe, Welwyn, Hertsfordshire, England)

Lipids 4, No. 4, 251-260 (July 1969)

and natural membranes. (3) the interactions of phospholipids and cholesterol; and (4) lipid-protein inrelevance of the thermal transitions to monolayer, bilayer, and membrane systems; tropic mesomorphism of phospholipids and effects due to presence of water; (2) lipid-lipid and lipid-protein interactions. He discusses studies of: (1) thermoteractions under various conditions, with special reference to serum lipoproteins This report is a review of studies conducted in the author's laboratory on [6 figures, 46 references] [Abstracter: F. T. Piskur

specific, selected media. [2 tables, 9 references]

ically significant inasmuch as Staphylococcus hemolyticus can be readily distinguished from Streptococcus hemolyticus. Staphylococcus hemolyticus esterase activity was about seven times that of Streptococcus hemolyticus, and carbohydrate content of the former was about one-half the content of the latter. If mixtures Strep. bovis, Strep. liquefaciens, Bacillus cereus, and B. globigii. The data on carbohydrate content, esterase activity values, and E/C ratios clearly demonof bacteria are to be studied, each organism must be isolated and transferred to strated a semiquantitative difference in these bacteria. This new technique is rapid--both analyses can be carried out in 1 hour. This technique may be clin-

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(0.321)

ON THE TABLE PUTTING 'PETRO-PROTEIN'

Chemical Week 105, No. 5, 41-42, 44 (August 2, 1969) Anonymous

tious, low-cost single-cell protein (SCP) from natural gas and petroleum. The big lion people for 1 year, specialists in food production believe that proteins from tions in the United States, Britain, France, the Soviet Union, Japan, Taiwan, Inof the world's output of crude perroleum is enough to make from 25 to 30 million tons of perro-montaine. tons of petro-proteins, enough to fill the protein requirements of nearly 2 bil-A large number of oil and chemical companies and several research organizadia, Czechoslovakia, and Switzerland are working on processes for making nutri-Agriculture Organization, food production must be tripled by the year 2000--but market potential for more and better protein foods. According to the Food and reason for such extensive research and development activity is the tremendous oil or natural gas have the potential to attain the FAO objective.

chain hydrocarbons, and its enzymes form an amino acid by inserting an amino rad-ical in the alpha position of the carboxyl group oxidized from the terminal carbon. either a single-cell yeast or a bacterium that will multiply rapidly on paraffin. a continuous mixture of compressed air. The microorganism devours the straightcontaining ammonia, phosphate, dextrose, and other nutrients is inoculated with The culture medium and the paraffin feedstock are fermented in the presence of Synthesizing proteins from hydrocarbons is comparatively simple. A broth

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE. (over)

Abstracter:

METABOLIC DERANGEMENT IN RESPONSE OF RATS TO INGESTION OF IMBALANCED AMINO ACID MIXTURES

(0.36)

Soliman, Abdel-Gawad M., and Kendall W. King (Department of Biochemistry and Nutrition, Virginia Polytechnic Institute, Blacksburg, Va.) Journal of Nutrition 98, No. 3, 255-270 (July 1969)

which result in depressed food intake and retarded growth in animals. These effects can be alleviated by adding small amounts of the most limiting indispensable amino acids to the diet. The purpose of the present very short-term study was to determine the metabolic bases for the gross effects of amino-acid imbalance and to evaluate the efficiency of utilization of the limiting and nonlimit-The term "amino acid imbalance" describes the dietary amino-acid patterns ing indispensable amino acids.

tests show that the retention efficiency and the efficiency of utilization of the indispensable amino acids are lowered despite an increase in their net retention. Because these metabolic derangements occur while the food is still being absorbed The results confirm the hypothesis advanced by Harper and coworkers (1964) that ingestion of unbalanced amino-acid mixtures results in severe depression in limiting amino acid are elevated, and that synthesis of protein is enhanced as a from the intestinal lumen, apparently the disorders are the initial effects, and that the retention efficiency and efficiency of utilization of the nonlimiting the levels of the limiting amino acid in plasma and tissue fluids. Also, the result of ingestion of unbalanced amino-acid mixtures. The data further show

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Abstracter: F. T. Piskur

ON RATS RAISED ON ALPHA-PROTEIN RATIONS: GROWTH AND STORAGE OF LIVER VITAMIN A (9.19) (Department of Agricultural Chemistry, Oregon State University, Tinsley, Ian J. Corvallis)

Journal of Nutrition 98, No. 3, 319-324 (July 1969)

The present author decided to explore one little-noticed variable, tween the nutritional stress caused by a diet of poor-quality protein  $(a ext{-}protein$ the possible interaction between nutritional status and toxic stress, as a meas-The researchers fed rats a-protein rations supplemented with The evaluation of the possible toxilogical hazard of a long-term, low-level exposure to a chemical, such as a pesticide, taking all variables into account, protein of soy beans is deficient in the sulfur-containing amino acids, particvarying levels of methionine and noted the effect of DDT on the growth of the ure of the toxicological hazard. They explored the possible interaction beof soy beans) and the toxicological stress caused by exposure to DDI. animals and the vitamin A level in the liver of the animals. ularly methionine. is difficult.

Maximum growth of female rats occurred when the level of methionine was at 1.0 g./kg. DDT suppressed growth of the rats when the diet was not supplemented with methionine, but when DDT was used at a level of 1.0 g./kg., the chemical stimulated growth of the rats. The When the level of methionine supplement was increased (in increments of from 0 to 4 g./kg.), the growth of male rats increased.

commercial fisheries abstracts vol. 22 no.12 page 5 united states department of the interior, fish and wildlife service.

Abstracter: F. T. Piskur

EXPLORATIONS FOR CALICO SCALLOP, <u>PECTEN GIBBUS</u>, IN THE AREA OFF CAPE KENNEDY, FLORIDA, 1960-66 (1.0116, 2.12)

Drummond, Shelby B. (Exploratory Fishing and Gear Research Base, Bureau of Commercial Fisheries, P.O. Box 1207, Pascagoula, Mississippi 39567) Fishery Industrial Research 5, No. 2, 85-101 (July 1969)

tending more than 100 miles north and about 100 miles south of Cape Kennedy, Flor-Introduction.--In June 1960, following reports by Florida fishermen of scaltops being caught in shrimp trawls, the Bureau of Commercial Fisheries used the explorations in 1960-66, the Bureau found an immense bed of calico scallops ex-Despite the interest of the industry in this enormous 200-mile-long bed, Silver Bay, an exploratory fishing vessel equipped with commercial scalloping gear, to explore the waters off the central east coast of Florida. During the the resource has remained largely unused, owing to the high cost of shucking calico scallops by hand.

They lie at depths of trom 5 to 40 fathoms. Relatively smooth bot-The Cape Kennedy scallop grounds cover some 5,760 square miles and extend from about 11 miles south of Stuart, Florida, to about 6 miles north of St. Augustine.... They lie at depths of trom 5 to 40 fathoms. Relatively smooth botom, which is composed mostly of sand and dead shell, makes the grounds ideal for dredging or for trawling with reinforced gear.

small but productive beds relatively near the Cape Kennedy grounds, and problems Recently, a fishery for calico scallops has developed in North Carolina on

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their metabolic consequences trigger an appetite-controlling mechanism that results in depressed food intake and retarded growth. [5 figures, 11 tables, 18 references]

[Abstracter: F. T. Piskur]

nonessential nitrogen when nonprotein energy was supplied by either glucose or soybean oil; however, in the absence of dietary carbohydrate, the requirement increased. These results support the concept that the ability of the chick to synthesize carbohydrate from triglyceride is limited. The effectiveness of other sources of nonessential nitrogen (asparagine, DL-alanine, L-alanine, NH4 acetate, (NH4)2 citrate, DL-serine, and soybean protein) was compared in meeting [5 tables, 9 references] the requirement for synthesis of dispensable amino acids. Either L-glutamic acid or L-aspartic acid could serve as the major source of

pensable amino acids must be provided preformed in the diet. could synthesize them from a source of nonessential nitrogen or whether the dishydrate, the question arose as to whether chicks fed carbohydrate-free diets altering growth rate. Because dispensable amino acids are derived from carbocompletely replace calories from carbohydrate in the diet of the chick without Renner (1964) and Brambila and Hill (1966) showed that calories from fat can

Journal of Nutrition 98, No. 3, 297-302 (July 1969)

Renner, Ruth (School of Household Economics, University of Alberta, Edmonton, Alberta, Canada)

EFFECTIVENESS OF VARIOUS SOURCES OF NONESSENTIAL NITROGEN IN PROMOTING GROWTH OF CHICKS FED CARBOHYDRATE-CONTAINING "CARBOHYDRATE-FREE" DIETS

(0.36)

table below, the protein content of some SCP products is compared with that of The product is washed, separated, and dried into a free-flowing powder. protein concentrates from other sources.

not been solved: taste, several problems have nucleic-acid content. Researchers, however, ting construction of and despite intensified research work, petro-protein units toxicity, cost, and are optimistic. Protein content | Amino acids\* percent 15.0 13.2 16.0 12.0 15,1 48.2 35-65 62-73 65-75 9-05 34.3 62 65 From conventional sources: bacteria/n-paraffins algae/carbon dioxide dried chipped beef yeast/n-paraffins From photosynthesis: bacteria/gas-oil Protein concentrate bacteria/methane From hydrocarbons: whole dried egg dried skim milk yeast/gas-oil fish meal

These values represent the percentage of the total protryptophan, and threonine -- four of the amino acids estein content that is supplied by lysine, methionine, sential for

[1 photograph, 1 table]

in shucking the scallops by machine are being solved. Thus, findings of the Bureau about the availability of calico scallops off the east coast of Florida are of immediate concern to prospective commercial scallop fishermen. The purpose of this report therefore is to make these findings known.

fishery at the more favorable locations. Explorations also show that, at depths Results. -- This article maps the location of the bed and reports on the rates than during February, the supply of scallops is adequate to support a year-round of catch that may be expected on it. Exploratory fishing indicates that, other of from 15 to 35 fathoms, the area between Fort Pierce and the southeast shoal off Cape Kennedy is consistently the most productive.

[14 figures, 1 table, 1 reference]

[Abstracter: L. Baldwin]

rine investigators. The advantages and disadvantages of shooting two nets simulauthor describes a coordinated exercise between a commercial gill netter and ma-[2 photographs] catching different species of tuna are discussed. color of the lure on trolling success, and the trolling speeds most suitable for taneously, the results of chumming the gill nets with live bait, the potential of poling albacore when the surface has been chummed, the effect of light and the In this second of a two-part article on tuna research in New Zealand, the

Commercial Fishing 8, No. 6, 30, 32 (June 1969)

(1.12, 1.017) NETTING TRIALS PROVIDE VALUABLE INFORMATION ON TUNA

on the vitamin A level in the liver was eliminated when methionine was added The great to the ration at a level of 4 g./kg. The fact that DDT depressed growth of rats on an  $\alpha$ -protein diet would suggest (1) that DDT reduces the biological value of est reduction occurred in the rats fed the unsupplemented ration; the effect of level of vitamin A stored in the liver was depressed when the animals were fed the protein, possibly by imposing some additional demand for methionine or by interfering with its utilization, and (2) that DDT and methionine interact in some fashion in the absorption and transport of vitamin A. DDT; the degree of response depended on the level of DDT in the diet. figure, 5 tables, 16 references]

Despite escala-

that have been coated with solid-phase carbon dioxide particles, applying carbon dioxide particles to the surface of the food, and keeping them in constant contact with solid carbon dioxide as they are moved through the tunnellike space formed by the walls. A number of individual pieces of food can be frozen by placing them on walls [Abstracter: L. Baldwin]

Quick Frozen Foods 31, No. 12, 30 (July 1969) Rubin, Julius (patentee; assigner to Thermice Corporation, Philadelphia, Pa.) U.S. Patent 3,446,030

METHOD AND APPARATUS FOR QUICK FREEZING INDIVIDUAL FOOD ITEMS

#### NEW STYLES IN TRAWLING

Anonymous

Sea Harvest & Ocean Science, pp. 14-15 (August-September 1969) (National Business Publications, Ltd., Gardenvale 800, Quebec, Canada) The wing (or vinge) trawl recently put into use by a few New England draggers is very effective for catching bottomfish and herring. Economically, it has adto fish for herring as well as all demersal species without the expense of extra vantages for a small dragger that conventional nets do not have--it can be used gear or changes in the vessel's layout; it can be adjusted to fish on bottom so rough that bobbins would normally be necessary; it will catch up to 20 tons of fish in a single short tow; and it will catch them even when they are much too scattered to be taken by purse seine.

as 8 in. stretched-mesh size. Only the tightness of the webbing prevents the fish of extremely fine twine (usually No. 9 or 12X terylene). Instead of heavy ground cables, it has two or three light bridles, each over 100 ft. long, fitted to each The wing trawl differs in several ways from conventional trawls. It is made from escaping, for the net is not just hung tight --it is hung to an inverse ratio (that is, the percentage of slack is put into the rope, not the webbing; thus the headline and footrope are longer than the stretched length of the webbing). The amount of slack in the lower wing, if there is any slack, may be as small as one-half mesh. The top sheets of the bag are one-half or one mesh shorter than their The wings and mouth of the net are made of large-meshed webbing, as large lower counterparts; this difference is not determined by a mesh count -- to allow

(over)

Abstracter: COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO.12 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

Baldwin

L.

THE GERMAN ONE-BOAT MID-WATER TRAWL. --DEVELOPMENT FROM 1959-1968

Schärfe, J. Fishing News International 8, No. 7, 26-28, 30,33 (July 1969)

schungsanstalt für Fisherei, Hamburg, modified the one-boat midwater trawl. These modifications included changing the two-panel nets to four-panel nets with "recand roundfish. Moreover, German trawlers are no longer confining their activities tests of the gear have established its efficiency not only for herring but for cod cod -- but was not satisfactory for less concentrated, more active fish. In search tangular" cross sections and using much larger otter boards, longer bridles, and heavier front weights. Thus the net opening was appreciably increased, and the to the North Sea; they now fish off Iceland, New England, and the west coast of Britain more actively than they do in traditional North Sea waters. of a remedy for this situation, the Institut fur Fangtechnik of the Bundesfor-Background.--The midwater trawl used by the West Germans before 1960 was reasonably efficient for catching nonactive fish--such as spawning herring or unfavorable influences from the trawler and the warps were decreased.

this decade's most important contribution to the advance of fish-catching tech-Description. -- The present article is the first of six giving a detailed account of the development and operation of the German one-boat midwater trawl, niques, according to the editor of Fishing News International. (over)

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

Abstracter: L. Baldwin

DESIGN FOR A CONTAINER TRAWLER -- A GERMAN SUGGESTION (2.118)

Fishing News No. 2932, 8 (August 15, 1969) Anonymous

operating large freezer/factory trawlers has been less successful than had According to Heinold Ritter, author of "The Use of Containers on Fishing Vesbeen hoped. One of the reasons lies in the failure of the auctioning system to provide adequate returns for owners and crew.

age, stows the frozen fish in them, and at the end of fishing, brings them to her quence that would promote a stable price structure and avert the need to consign good quality fish to the fishmeal factory. Three methods of operating with con-(1) The ship precools the containers on the outward voytwo sets of containers are required. (2) The ship unloads her filled containers takes on a fresh supply of empty containers there. With this method, either two With this method, (3) The ship discharges her filled con-These containers, each equipped with its own freezing unit, could be stored until the market becomes favorable; or the fish in them could be released to the market in a sesome port more accessible to the fishing grounds than the home port is and tainers on board a mother ship/transport ship and receives empties in return. home port and exchanges the loaded containers for empty ones. The refrigerated container could help solve the problem. With this method, three sets of containers are needed, or three sets of containers are needed. tainers are suggested.

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(2.1471)

Brady, Peter

Fishing News International 8, No. 7, 46 (July 1969)

SWITCH FISHING MAY LEAD TO CHANGES IN STERN TRAWLER DESIGN

fishermen become more experienced in their use, situations increasingly arise in Problem. -- As electronic fish-detection systems become more sophisticated and expedient because of the different types of trawl doors required and because of the amount of room available on the deck of present-day trawlers. In the past, investigators have experimented with two-deck trawls, either one deck above the other or two decks side by side. Although the U.S.S.R.'s catamaran trawler Experiment features the side-by-side configuration, it is not very feasible for shoal is on the bottom when the fisherman's midwater gear is rigged or it is in Thus he needs more versatile gear or two sets of gear ready for immediate use, neither of which is a commonly used which fish in shoals that have been pinpointed cannot be caught -- either the standard stern trawler because of the limited beam. midwater when his bottom gear is rigged.

operate with two sets of gear. East Germany and Poland offer such vessels. Both midwater and bottom trawls are on deck ready for shooting, a capability made pos-Solution. -- Now several countries are offering new stern trawlers designed to The trawl winch is incorporated as two separate units and is located toward the stern between the inner and outer sible by a change in the layout of the deck.

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COMMERCIAL FISHERIES ABSTRACTS VOL.  $22\,$  NO.  $12\,$  PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

Abstracter: L. Baldwin

schaft 15, Nos. 3-4, 104-172, in German. An English translation is available for \$3 from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. The 65-page typescript translation has the identifying designation "TT 68-50211." version of Dr. Schärfe's account was published in Information für die Fischwirt-

[1 figure, 5 photographs]

[Abstracter: L. Baldwin]

not be fished with the same techniques as those that appear as clouds or as lay-[8 figures] cedures required to catch them. blue whiting (Micromesistius poutassou) is mentioned in terms of the fishing proently to the approaching net. Schools that appear on the echograms as poles canof various fishes to the trawl. For example, spawning and nonspawning herring, whether in the Skagerrak-Egersund area or on Georges Bank, react entirely differplicability, over the years, of the one-boat midwater trawl for harvesting a variety of commercial species of fish, it contains a detailed analysis of the reaction Although this article is directed basically toward a description of the ap-The commercial potential of such species as coalfish (Gadus virens) and

Scharfe, J. (Gear Technology Section, Department of Fisheries, FAO, Rome, Italy) Fishing News International  $\underline{8}$ , No. 8, 18-20, 22 (August 1969)

FISHING CONDITIONS FOR THE HERRING AND OTHER SPECIES THE GERMAN ONE-BOAT MID-WATER TRAWL. PART 2.

The net fishes best at a narrow angle of attack, a conagainst its counterpart. The net fishes best at a narrow angle or actack, a conformation achieved by finely hung otter boards and much longer cable between the for slight discrepancies in mesh sizes, each sheet is stretched out and measured doors and the bridles. Despite its fishing and economic advantages, the wing trawl must be precisely the difference of a few inches in the bridles will raise or lower the net significonstructed and used with skill and care. Warp length, cable length, and proportional length of upper and lower bridles must be precisely adjusted (for example,

cantly), as both setting and towing speed must be. [MODERN FISHING GEAR OF THE WORLD, Hilmar Kristjonsson (ed.), pages 357-358 (1959), gives construction details and results of fishing trials made with a Danish vinge trawl on Black Sea anchovy.]

The beam trawl is especially suited to fishing on bottoms where large vessels trawl nets can be converted interchangeably with ease. Most small beam trawls can be hauled on a single warp by the trap-hauling device used on most small boats. [2 figures] whether the doors and the trawl mouth are opening correctly or whether the groundrope is digging in or not. The trawl opening remains fixed and is not affected by the length of the warp, alteration of course, correct opening of the doors, or cannot fish. Its use for shrimping, for catching flatfish and other species living close to the seabed, and for one-man fishing among weeds and grass is regaining favor. With the beam trawl, the fisherman does not have to worry about On suitable bottoms, tickler chains can be fastened between the shoes without affecting the width of the trawl. Beam trawl nets and other changes in the tide,

2.115

bulwarks. The trawl warps and the entire trawl deck are forward of the winch position, right up between the port and starboard superstructure, aft of the deckhouse. Two sweep-line winches are mounted side by side on the boat deck; each takes the cables from a different trawl.

installation of two net drums may be the best answer now available to the problem. The British are working on a design in which two net drums at the fore end of the trawl deck will be used to take in both the cables and the net. No pracbe used successfully with the heaviest deep-sea bottom gear; the Dutch have used tical trials of this trawler configuration have been made yet. However, tests with a full-sized net drum aboard a side trawler have shown that net drums can them aboard stern trawlers for midwater gear. Thus, the author suggests, the

mounted engine rooms. The Japanese have already built small stern trawlers with split trawl-warp winches mounted aft and a net drum mounted just forward of amid-Implications. -- Incorporating these ideas may well change the basic design of the stern trawler, especially the design of smaller vessels and those with aftships. It is highly probable that they will also adapt the design to larger vessels.

container trawlers, Ritter says, is impossible. Altering hatches, installing the atively small vessels to operate on the most distant fishing grounds, the capital essing and distributing organization, or the financial resources of a large com-Although the second and third methods of operating make it possible for relrequired would necessitate the cooperation of an economically substantial procnecessary stowing and loading gear, and disturbing existing fishing and factory pany or group. Moreover, the modification of present vessels to operate as facilities make such modification impractical from the start.

hold. Her six-drum main winch has a pull of 14 tons at a heaving speed of 120 m. carries a crew of 19, with 2 reserves. Her bunker capacity is adequate for from 16 to 18 days of fishing plus the outward and homeward voyages; cruising speed is 13 knots. Her twelve 20-ft. containers will hold 158 metric tons of frozen per minute. Her own lifting gear is capable of loading and unloading the containers, each of which has a gross weight of 20 tons. defined. The ship is a stern freezer-trawler, 58 m. long and 12 m. wide. She fish; since they are insulated, no further insulation is required in the fish article, the details of construction and the gear and equipment are precisely The ship must be expressly designed for container trawling. In Ritter's

Construction costs for building such a ship are not expected to run more than 10 percent over those of a conventional freezer-trawler; however, the price of three sets of containers must be added to the final cost. [1 figure]

1.01111)

ECONOMIC RETURNS TO POLISH FACTORY TRAWLERS IN NORTHWEST ATLANTIC

Bureau of Commercial Fisheries, 7338 Baltimore Avenue, College Park, Maryland (Division of Economic Research, U.S. Fish and Wildlife Service, Noetzel, Bruno G.

Commercial Fisheries Review 31, No. 6, 56-61 (June 1969) (Separate No.

year after year. The pressure has accelerated with introduction of new fishing techniques--and transfer of fish-processing activities from land to fishing grounds Background. -- The Northwest Atlantic has the world's richest resources of food is also the most exploited part of the ocean. Fishing effort increases via factory ships.

are equipped with highly mechanized fish-processing facilities: freezing, fish meal, and fish oil plants, and refrigerated holds for frozen products. capable of converting the entire catch into final marketable products: Large fleets of modern stern-ramp trawlers operate year round. fillets in blocks, fish meal, and fish oil. These huge fishing and processing vessels, built entirely with state funds, are representative of the direction of fishery development in most of the Eastern European countries in the past 10 years.

series of these modern fishing vessels to Poland's state-owned fishing industry. Operation. -- On Oct. 22, 1960, the Gdansk Shipyard delivered the first in a

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(2.1471)

HOLLAND-MARTIN REPORT ON TRAWLER SAFETY (CMMD, 4114)

Distributed from HM Stationery Office, 49, High Holborn, London, WCl, England. 114 + 40 pp. (July 1969) Price 14s 6d
Fishing News No. 2930, 1, 3-5 (August 1, 1969) Holland-Martin, Sir Deric (comm. chrm.)

After more than a year of investigation into the way British deep-sea trawlers Representatives of the British Trawlers Federation, the owners, both of the economic difficulties of the deep-sea trawler industry and of the fact are built, equipped, manned, and managed, the Committee of Inquiry into Trawler Safety, under the chairmanship of Admiral Sir Deric Holland-Martin, has published already announced that the Government accepts in principle the 83 recommendations The President of the Board of Trade has goes beyond the mere safety of trawlers and examines the basic structure of the fishing industry in relation to safety. The President of the Board of Trade has and the White Fish Authority have been heartened by the scope of the report -- it contained. Of particular note throughout is the committee's evident awareness many of its recommendations could, in the short run, add to them. final report.

leave on shore, work schedules, size of supernumerary crew, certification requirethe role of management in the maintenance of safety, the relation of shore-Among the specifics examined and recommended to be changed are the system of recruiting and training officers and men, policies governing rest aboard ship and based management and the skipper, promotion practices, salary and wage arrangements, clothing allowances, shipboard communication equipment, and criteria for

commercial fisheries abstracts  $_{\rm VOL}$  22 no 12 page 9 united states department of the interior, fish and wildlife service.

L. Baldwin Abstracter:

UNDER-EXPLOITED GROUNDFISH ON THE NOVA SCOTIA BANKS (2.06, 6.9) J. S. (Fisheries Research Board of Canada Biological Station, St. Andrews,

Fisheries of Canada 22, No. 2, 13-15 (August 1969) New Brunswick)

of these fish stocks are being very heavily exploited, and some (such as haddock) search cruises. Depths of from 30 to 250 fathoms have been fished by otter trawl Present Canadian fisheries are based on the intensive fishing of only a few In search of a solution to the problem, the Fisheries Rethat have been caught on the Nova Scotia Banks over the past 10 years during reget an indication of the species that may be worth investigating further, either during all seasons of the year. From the numbers recorded, the researchers can search Board of Canada has recorded the numbers of groundfish of every species for direct consumption or for conversion to fish protein concentrate (FPC) or species -- cod, haddock, redfish, herring, flatfish, and a few other species. are being overfished. fish meal.

do not appear in Canadian landing statistics. Specific efforts to catch these species, and haddock, may have distorted their catch rates; however, landings by the U.S.S.R. on these banks (15,000 tons of argentine in 1966 and 123,000 tons of silver hake in 1963) seem to confirm their potential. Although the top of the list is composed mainly of commercial species, argentine (<u>Argentina silus</u>) and silver hake (<u>Merluccius bilinearis</u>) The table on the back shows the main species caught, ordered by weight per 100 hours of fishing.

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Baldwin

BEAM TRAWLING A PROFITABLE OPERATION

McCallum, I. D. (Fisheries Research Division, Marine Department, Wellington, New Zealand)

Commercial Fishing 8, No. 6, 10-11, 13, 15 (June 1969)

only for shrimp but for flat fish, cod, and whiting. The grounds normally fished have mud, sand, or shingle bottoms, and the fishing is done in waters 5 to 40 fath-The result was so successful that many Dutch trawlers did likewise. This article describes, with line drawings, the gear used, the method beam trawls. The result was so successful that many Dutch trawlers did likewist Now vessels from both countries are fishing two beam trawls simultaneously, not In 1959, two Belgian shrimp boats were converted from otter trawls to twoof operation, and the advantages and disadvantages of the system. only for shrimp but for flat fish, cod, and whiting. oms deep.

foot rope does not dig into soft mud and bog down as much as that of an otter trawl tends to do. Operating two trawls simultaneously, the fisherman has a means of comparing the effectiveness of two different gear configurations--and making The main advantages of beam trawling, relative to otter trawling, are as foldoes on an otter trawl. The track fished by two beam trawls is as much as 20 per-cent wider than that of an otter trawl equipped with tickler chains. Course al-The length of warp paid out for a given depth of water is less critical, terations do not change the opening of the net. Cross tides do not affect beam trawls as much as they do otter trawls. A beam trawl does not have to lie with for the drag of the warp has less effect on the action of a beam trawl than it its beam to wind and sea during hauling and shooting, as a side trawler does.

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO.12 PAGE 9 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

L. Baldwin Abstracter:

vessel stability. The report pointed out the superior safety of stern trawlers over side trawlers, recommended the deployment of support ships, particularly in industry would be represented) at the national level so the problem of safety in northern waters, and, as a final recommendation, suggested that machinery be set up to coordinate the work of port safety committees (on which both sides of the the deep-sea fleet could be kept under continuing review.

[Abstracter: L. Baldwin]

to bring a new approach to the solution of old problems. This article traces some of these approaches and solutions. Of particular usefulness are the names and addresses of the licensees and manufacturers of several pieces of equipment that have been developed and put on the market through the efforts of the IDUoutside the fishing industry -- mainly from the aircraft industry -- the object being (IDU) specifically charged with stimulating, subsidizing, and even financing the introduction of improved equipment, methods, and vessels for the fishing industry. The scientists and engineers who formed the nucleus of the IDU were recruited from drum, and a hydraulically operated shipboard gutting machine.
[2 figures] porating a special derrick) for hauling seine nets, a hydraulically driven trawl for example, a hydraulically powered seine net winch, a power block system (incor In 1963, Britain's White Fish Authority formed an Industrial Development Unit

Noel, H. S. ("World Fishing," London, England) Commercial Fishing 8, No. 6, 25-28 (June 1969)

DEVELOPMENTS IN FISHING GEAR AND EQUIPMENT --ROLE OF BRITAIN'S WHITE FISH AUTHORITY

By the end of 1965, twelve factory trawlers of the type...were in operation....

During the 5-year period 1961-1965, these vessels made 75 trips (a total of 27.75 vessel-years were analyzed) to the Northwest Atlantic fishing grounds (International Commission for the Northwest Atlantic Fisheries (ICNAF) Convention

ing activity). The vessels averaged 496 hauls and 860 hours of trawling during the 58 days. The average catch from 75 trips to the ICNAF area was 1,676.5 m.tons. The average fishing activity per trip was 58 days (one day = 24 hours of fish-Effect. -- In 1965, the Polish fleet represented 11 vessel-years of operations-10 vessels were operated all year, and 2 joined fleet during year. This fleet caught 52.2 thousand m. tons of fish in the ICNAF area. It accounted for 18.6%

of total landings by entire Polish fishing industry. This quantity is a significant portion of Polish landings, but it is only 1.6% of 1965 landings by all coun-Over the 1961-1965 period, the catch by Polish factory trawlers from ICNAF tries in ICNAF area.

area (125.7 thousand m, tons) was 0.9% of all landings.

Returns. -- The returns trawler for 1963 through of an average factory

[5 figures, 3 tables]

853.3. 527.4 79.1 ...(1000 zloties).... 45480.2 | 48344.7 | 47376.6 34392.0 | 32645.0 | 29273.0 13712.6 12.7 4391.0 1965 4869.8 10.0 1964 5158,8 5.5 5929.4 1963 Return on investment Operating costs Overhead (15%) Gross revenue Gross profit

crayfish boats are much more easily converted to beam trawling than to otter trawling for use during the off season. Normally the beam trawl catches flatfish withperformance of the trawl gear. Normally a beam trawler needs one man less in the crew than an otter trawl needs. Such specialized boats as oyster dredgers and Up to seven tickler chains can be fitted to the beam trawl without closing the net opening or otherwise seriously affecting the out all the rubbish caught by the otter trawl with its higher headline. immediate changes as necessary.

peller. If one of the two nets of a two-beam trawler comes fast in a strong curpreventive steps (such as releasing the winch brakes and allowing the trawl wire to run out, transferring the towing point from the top of the derrick to deck level). Because the beams cannot be properly secured when they are slung outboard, even the best beam trawlers give up in rough weather when otter trawlers can still work. [7 figures] trawls are being worked, one on each side of the vessel, a straight course must be maintained during shooting and hauling; otherwise the nets may foul the prorent, the boat can capsize unless the crew has been trained to take immediate The main disadvantages of the beam trawl are as follows. When two beam

Sedlacek, Zdenek, Vladimir Lavicky, and Stephan Danhel (pat.) Chemical Abstracts 70, No. 26, 116204u(June 30, 1969) Czechoslovakia Patent 128,234

PERMANENT HYDROPHOBIC AND STIFFENING IMPREGNATION OF FISHING LINES AND TEXTILE FIBERS

2.12

Catch rate per 100 hr , 039 , 630 ,554 8,311 5,749 4,459 ,092 1,650 ,273 ,161 780 601 545 342 342 46 46 44 38 9,191 Longhorn sculpin Spiny dogfish Common hake Silver hake Sand launce Groundfish Yellowtail Sea raven Argentine Grenadier caught Wolffish Halibut Redfish Eelpout Haddock Pollock Plaice Angler Skates Witch Squid Cusk

Among the significant species in the lower part of the list are anglers, or monkfish, and skates; together they make up 4 percent of the cies, combined, constitute almost 5 percent of of fish meal; wolffish, eelpout, and cusk, to a limited extent, for direct consumption. The ures as a whole show that at least 25 percent the total. Skates and spiny dogfish are potentially important as a source of FPC; sculresource in the Northwest Atlantic. The figpins, sand launce, and sea raven as a source data indicate that squid, which approach the of the available groundfish resources of the total catch. The other relatively minor spe-Nova Scotia Banks in immense numbers in the spring, may constitute the greatest fishery Nova Scotla Banks are not being used. [1 figure, 1 table]

### HANDLING SMOKED FISH -- RECOMMENDED PRACTICE FOR RETAILERS

15 (April 1969) 13, 4, No. Commercial Fishing 8,

fish from which the smoked product was made. To help retailers ensure that smoked fish products reach the customer in first-class condition, this article (a reprint of Torry Advisory Note No. 14) provided guidelines for inspecting newly delivered uct), the shelf life of smoked fish is ohly slightly longer than that of the fresh smoked fish products and for handling the products during the period between their cial smoking is largely done to enhance flavor and odor, not to preserve the prod-Since the preservative effect of smoking is negligible (present-day commerdelivery at the store and their sale.

be bright and glossy, showing no traces of salt crystals or of smut, dirt, or proc-Upon delivery, the fish should be examined physically. Their surface should The smell, though somewhat masked by smoke processing, should not be essing residue. The flesh should be firm and springy to the touch, showing no extensive gaping and no discoloration; the skin should not slip too easily from the flesh.

objectionable.

small quantities being laid out for display. At intervals, samples of the fish should be cooked and tasted to ensure that they have developed no off-flavors or After acceptance, most of the fish should be stored in a chill room--only

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L. Baldwin

Abstracter:

INACTIVATION OF RIBONUCLEASE AND OTHER ENZYMES BY PEROXIDIZING LIPIDS AND BY MALONALDEHYDE

Chio, K. S., and A. L. Tappel Biochemistry 8, No. 7, 2827-2832 (July 1969)

reports on a study of the types of interactions that take place between oxidized Barber and Bernheim (1967) considered lipid peroxidation to be a damaging reaction in biological systems. The oxidation of polyunsaturated fatty acids is considered a mechanism of disruption of biological membranes. The present paper lipid products and enzymes. The authors describe (1) the mechanism of the reactions between (bovine pancreatic) ribonuclease A and polyunsaturated lipids, and between ribonuclease A and malonaldehyde to give yellow, fluorescent products, and (2) the nature of the cross-linkage of polymerized ribonuclease A.

ucts of peroxidation of lipids. The oxidation products of polyunsaturated lipids Sulfhydryl enzymes are most susceptible to inactivation by intermediate prodin the enzyme-lipid reaction mixtures accompanies the loss of ribonuclease A activity. The inactivated ribonuclease A shows fluorescent monomer, dimer, and higher molecular weight species in the Sephadex G-100 fractionation pattern. also inactivate nonsulfhydryl enzymes, such as ribonuclease A. A fluorescence

Ribonuclease A that is inactivated by malonaldehyde, shows fluorescence and The authors postulate that malonaldehyde a gel filtration pattern similar to that of the ribonuclease A inactivated by a gel filtration pure peroxidizing polyunsaturated lipids. The (over)

commercial fisheries abstracts vol.  $22\,$  no.  $12\,$  page  $11\,$  united states department of the interior, fish and wildlife service

Ĭ. ٠ Abstracter:

EFFECT OF INTRAMUSCULAR INJECTION OF PENICILLIN ON BACTERIAL SPOILAGE Vadehra, D. V., R. C. Baker, and H. B. Naylor (Department of Poultry Science, Cornell University, Ithaca, New York 14850) Poultry Science <u>48</u>, No. 3, 1120-1121 (May 1969) Hake meal was used in broiler rations to determine its value as a feed sup-Its value was compared with that of herring meal. plement.

equivalent amount of soybean meal protein with necessary adjustments in the levels of calcium and phosphorus. The feeding test was carried out over an 8-week period. Twenty-four-day-old broilers were fed rations containing varying amounts of hake meal, herring meal, or combinations of both. The fish meals replaced an

control ration. Similar improved feed conversions were noted when broilers were fed 5 percent herring meal or a combination of 2.5 percent herring meal and 2.5 Broilers fed 5 percent hake meal showed a significant decrease in feed consumption, and feed conversion was significantly improved over the soybean meal percent hake meal, Further improvement in feed conversion was noted when the broilers were fed a combination of 5 percent hake meal plus 5 percent herring

Up to 7.5 percent hake meal can replace a equivalent amount of soybean meal protein in broiler rations (broilers fed this ration show a marked reduction in

(over)

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12 PAGE 11 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

F. T. Piskur Abstracter:

SUMMARY AND REPORT ON RECENT DEVELOPMENTS IN POULTRY NUTRITION. A REVIEW OF PAPERS PRESENTED AT THE 1969 POULTRY SCIENCE ASSN. MEETING - PART 1

Couch, J. R. (Texas A. & M. University, College Station, Texas) Feedstuffs 41, No. 37, 21, 24 (September 13, 1969) Included in the 100-odd papers presented at the 1969 meeting of the Poultry Science Association held at Ft. Collins, Colorado, were those reviewed below.

A group from North Carolina State University compared the nutritive value and the cost of diets containing fish meals produced by the "conventional" method and composed primarily of corn and fish meal, the heat-transfer method gave a signifin the meals was not significant. The author concludes that fish meal processed by the conventional method is satisfactory. by the heat-transfer method. In diets containing only 15 percent protein and icantly better feed conversion; however, in a practical type diet,

The group from Kansas State University that has been active in catfish nutricomposition, and the feed conversion of processed catfish offal (a dried catfish scrap product) is equal to that of marine fish meal. The author says that he knows of no other instance of the processing and evaluation of catfish offal, tion over the

A research group from the University of Arkansas used broiler breeders to demonstrate the effect of the "fish factor" on hatchability--the effect carries over from the breeder through the egg to the chick. The author notes that such findings have been previously reported.

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,

markedly similar to age pigments. The ribonuclease A-polyunsaturated lipid prodis probably the agent responsible for the intra- and intermolecular cross-linking of ribonuclease A. The ribonuclease A-polyunsaturated lipid product is uct and cardiac age pigments, which are a protein-lipid complex, are markedly similar--particularly in their fluorescent characteristics. [5 figures, 2 tables, 42 references]

formed by slow chemical hydrolysis of phospholipids after oil production. [Abstracter: F. T. production of the oils. hydrolysis of the triglycerides. This hydrolysis probably occurs before or during through hydrolysis of the flesh phospholipids and, to lesser extent, through the The FFA's of the nine commercially produced herring oils were produced mainly The authors suggest that in some instances FFA may be [Abstracter: F. T. Piskur]

governing the price of the oil to the refiner. Occasionally, herring oils with low levels of FFA develop unexpectedly high levels of FFA during prolonged storage or during shipment. As part of a broad study to determine the factors governing FFA levels in fish oils, the authors examined the composition of FFA from nine herring oils commercially produced during the summer of 1968. The free fatty acid (FFA) level of herring oil is often one of the factors

Journal of the Fisheries Research Board of Canada <u>26</u>, No. 6, 1577-1583 (June 1969)

Addison, R. F., R. G. Ackman, and J. Hingley (Fisheries Research Board of Canada

FREE FATTY ACIDS OF HERKING OILS: FOODERED PROPERTY OF TRICLYCERIDES IN FRESH HERRING

The length of time several kinds of smoked product will remain in each of these conditions is tabulated below.

Fish kept at 32° F. will keep in first-class condition 3 or 4 days longer than

fish kept at room temperature; they will remain edible for as much as a week

edible 8-10 10-14 3-4 10-14 5-6 10 9 Condition and shelf life of product stored at 32 prime 9-7 3-4-6 3-4 edible 2.5-3 2.5-3 9-4 3-62-3 2-3 2-3 1-2 1-2 1-2 2-3 1-2 2-3 1-2 individual fillets kippers & kippered Cod: individual fillets block fillets unwrapped whole gutted wrapped bucklings bloaters finnans fillets smokies fillets pales Cold smoked -Fish product Haddock: Hot smoked Herring: Haddock: Herring: Salmon: Trout:

that an earlier report from West Virginia University stated that taurine possesses Scientists from the nutrition research laboratory of Borden, Inc., hypothesized that taurine is one of the elusive unidentified growth factors (UGF). They found that a fermentation factor, which occurs in Fermacto-500, is required along growth-promoting activity when included in chick diets. He also notes that pracwith taurine for maximum growth. Fish meal and poultry byproduct meal were found to be good sources of taurine; meat and bone meals were not. The author notes tical feed formulations still contain sources of UGF. The primary problem the seaweed industry now faces is obtaining enough raw material to keep the plants in operation. The total capacity of all plants is now 1,800-2,000 tons annually; actual production was 890 tons in 1965, 600 tons in 1966, and 925 tons in 1967. This means that Spanish agar-agar plants have been operating at only about 42 percent of total capacity. [Reprinted in part]

England, Germany, Czechoslovakia, USSR, Italy, and Poland. exporter of agar-agar in the world. Spain is the largest

by Japan. However, the domestic use of agar-agar in Spain is not significant. Therefore, 85 to 90 percent of the agar-agar produced is exported to the U.S., by Japan. Spain is the second largest producer of agar-agar in the world, exceeded only

tain this product from Spanish seaweeds. Small-scale investigations were started and imitated Japanese techniques. lack of Japanese supplies induced Spanish bacteriologists to try to obindustry, principally the manufacture of agar-agar, began in 1940

vice, Washington, D.C. 20240)
Commercial Fisheries Review 31, Nos. 8-9, 60-61 (August-September 1969) Durrant, Norman W. (Bureau of Commercial Fisheries, U.S. Fish and Wildlife Serv-(1.0148)

THE SPANISH SEAWEED INDUSTRY

mal wastes is to prevent the formation of the malodorous substances. For cont of odors from poultry wastes, the author suggests in-house drying of the mater or collection of the material in a mixture of cold water and phosphoric acid. [6 figures, 2 tables, 21 references] ganic acids, and skatole were the more important components involved in air pollution. The author suggests that the best components the malodor of accumulated liquid poultry manure. This paper reports on the identification of the volatile compounds responsible The author suggests that the best way to control air pollution from anithe author suggests in-house drying of the material [Abstracter: F. T. Piskur] The sulfur compounds, or-

hake meal and 2.5 percent herring meal as a supplement, they showed improved feed gained more weight and showed improved feed conversion over those fed the soybean

when 5 percent each of hake meal and herring meal was used.

[2 tables, 3 references]

meal control rations. When broilers were fed the combination of 2.5 percent of conversion over those fed the control ration; feed conversion improved further

feed consumption). When 5 or 7.5 percent herring meal is used to replace an

equivalent amount of soybean meal protein in broiler rations, the broilers

Burnett, William E. (Department of Food Science, Cornell University, Ithaca, New Environmental Science and Technology 3, No. 8, 744-749 (August 1969) York 14850)

ORGANOLEPTIC TECHNIQUES DETERMINATION OF MALODORS BY GAS CHROMATOGRAPHIC AND AIR POLLUTION FROM ANIMAL WASTES

ON RECENT DEVELOPMENTS IN POULTRY NUTRITION. A REVIEW OF PAPERS PRESENTED AT THE 1969 POULTRY SCIENCE ASSN. MEETING - PART 2 SUMMARY AND REPORT

sexual maturity, and liveability. A soybean-and-10-percent-anchovy-meal diet gave the lowest egg production and hatchability. The overall flavor of eggs from hens fed the soybean diets was the most acceptable; that of eggs from hens fed the hake ditional study, these two meals, Norwegian herring meal, and Peruvian anchovy meal A group from Washington State University compared Pacific Ocean hake meal and British Columbia herring meal at levels of 5 and 10 percent in starter and laying diets and at 5.0 and 7.5 percent in pullet developer diets. The two meals were was objectionable, eggs from hens fed the hake meal being the more so. In an adequally satisfactory for growing pullets. Although the laying-house performance of pullets fed the laying diets was satisfactory, the flavor of the fresh eggs were tested for various effects on poultry. All produced satisfactory growth, No. 38, 20, 22, 43-44 (September 20, 1969) meal was the least. Feedstuffs 41,

COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 12 PAGE 13 UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE

AS A CONTRIBUTOR

L. Baldwin

Abstracter:

eart, Norman W. (Branch of Technology, Bureau of Commercial Fisheries, U.S. Department of the Interior, Washington, D.C. 20240), and Carol Jolly (RD No. 2, Durrant, Norman W. (Branch of Technology, Bureau of Commercial Fisheries, U.S. GREEN ALGAE, CHLORELLA, TO THE FOOD SUPPLY OF MA

Fishery Industrial Research 5, No. 2, 67-83 (July 1969) Salem, New York 12865)

Some 17,000 known species of algae inhabit the fresh and marine waters of the world. Of these 17,000, only a few have been carefully investigated to determine value are used worldwide in many forms and in many types of products. These in-clude uses in such products as fertilizers, animal foods, human foods, and incortheir value as a human food resource. Those few that are of known commercial poration into pharmaceuticals and cosmetics.

unique One of the more promising algae having potential as a continuing human food resource is the unicellular green algae, Chlorella. This alga has several unique characteristics that contribute to its potential value. These include (1) rapid growth rate, (2) variability of composition as a result of varying the environment, which can be controlled, and (3) ability to reproduce and grow in a closed

Accordingly, this report centers largely on green algae (Chlorella in particular) and discusses both their artificial production and nutritional value.

Action and findings. -- Animal and human feeding studies have been made to de-Though several of the tests were termine the nutritive properties of Chlorella.

(over) COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 12 PAGE 13 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

Reprinted in part

ALABAMA'S RICO LIQUIDS CONTINUE EXPANSION INTO LIQUID FEED FIELDS (6.55, 9.14)

37, 40-41 (September 13, 1969) No. Feedstuffs 41, Brown, Robert

tritionists on liquid feed supplements, with the decreasing availability of grain industrial use and human consumption; today, 40 percent goes for those purposes), and with the increasing demand for meats, the market for liquid supplements is Although liquid feeding was used in England as far back as 200 years ago, it for use in animal feeds (10 years ago, only 10 percent of the corn crop went for But with the cooperation of scientists and nunever actually was successful. growing.

the surface as most conventional feeds do; thus it is more attractive to the fish the pond with a scoop. It remains on top of the water rather than settling below The latest product developed by Rico Liquids, a relative newcomer to the field, is a fermented tuna broth fortified with vitamins and minerals and homogeshown that top feeding results in less loss of young fry, elimination of guess work as to whether the feed has been eaten, lower mortality rates among the fish, nized into a catfish feed. The resulting broth is mixed with ground limestone or oyster shells, which provide calcium for flotation. The feed is thrown into and it gives the grower better control of his feeding costs. Field trials have and a higher yield.

Abstracter: COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO. 12 PAGE 13 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

Γ.

A POTENTIAL SOURCE OF HIGH-QUALITY PROTEIN MUSSELS: (1.88)

Seattle, Washington Joyner, T., and John Spinelli (Biological Laboratory; Technological Laboratory, Bureau of Commercial Fisheries, 2725 Montlake Blvd. East, 98102)

8-9, 31-35 (August-September 1969) Commercial Fisheries Review 31, Nos. The Bureau of Commercial Fisheries has undertaken extensive technological research into the development of a system for the conversion of fish into FPC (fish protein concentrate) of good quality with a promising market potential.

different species as sources of raw material. FPC of high quality has been pro-A viable protein-concentrate industry will require the use of a number of chovy. The need for high-quality marine protein for both human and animal use duced from hake, as well as from oily species such as menhaden, herring, dictates a continuing search for suitable raw materials. In any assessment of other marine sources of protein, mussels appear very promising. Their wide distribution, fecundity, rate of growth and growth density already have been adapted to highly successful culture systems in many parts of

To explore the feasibility of using mussels as a source of dry, protein concentrate, we prepared samples from Puget Sound bay mussels (Mytilus edulis). (over)

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Reprinted in part

is rather difficult for humans to digest, and the appearance of the product was not generally well accepted. The Japanese, however, have a high level of acceptance and tolerance for the product. This indicates that the digestive system of humans can adapt to various changes in the diet. Also, breaking down the cellular structure of Chlorella by physical or chemical means would make this alga inconclusive, the results generally indicate that Chlorella in its natural form

By a suitable manipulation of variables, green algae containing as much as 50 percent or more protein, on a dry-weight basis, can be manufactured continuously on a large scale. [1 figure, 23 references]

[Abstracter: L. Baldwin]

umes, wheat and gluten, milk, and miscellaneous materials, such as algae. chapter covers production of textured foods, such as meat substitutes. carbon fermentation and from fish, soybeans, cottonseed, other oilseeds and legorganized by base material, describe the methods of producing proteins by hydroand patent number 126 methods of producing protein materials. Its eight chapters, This book, which is based on patent literature, indexes by company, inventor, Food Processing 30, No. 9, 63 (September 1969) Published by Noyes Development Corp., Park Ridge, New Jersey. \$35. (n.d.) Noyes, Robert

Protein Food Supplements-69

(9.6)

REVIEW OF PROTEIN PRODUCTION METHODS

A group from Texas A. & M. Uhiversity compared the effect of feeding laying hens different levels of calcium from two different sources. The results tabulated below show that hens can use Ca from calcium carbonate and oyster shell flour equally well.

Feed	kg.feed/kg.eggs 2.68 2.62
ance Egg ge size co	8.7 60.7 61.6
Performance average	percent 68.67 68.33
Hen-day production when Ca fed at a percentage level of Performand 2.00 2.75 3.50 average	67 68 71 69 69 67
Calcium source	Calcium carbonate Oyster shell flour

The author notes that the equivalent value of these two calcium sources has been reported many times previously.

availability of cystine, methionine, and lysine varied appreciably among the meals. A group from the University of Arkansas compared the content and availability 7 different amino acids occurring in 7 different fish meals. Both content and Peruvian meals and herring meals having the highest. Availability was measured by disappearance from the intestines; the presence of antioxidants had no effect on this property.

concentrate (MPC), samples produced by isopropanol extraction of steamed mussel To evaluate the nutritional and chemical characteristics of mussel protein meats were analyzed for proximate composition, minerals, and protein efficiency ratio (PER), Table 1 shows the results of these analyses. Table 1 - Nutritional Evaluation and Chemical Composition

of Mussel Protein Concentrate on Concentration

70.0 percent 0.2 percent 15.0 percent

water--a characterily dispersible in istic probably recontent of glycolated to its high MPC is read-

Test or Component

Carbohydrate (glycogen) Protein Lipid

Fluoride for mass production at low cost of pro-The technology

ment of all promising sources of raw material is obviously needed. Mussels should vironmental similarities of potential growing areas in North America with areas of high production of cultivated mussels in Europe and the Far East; and the relatein concentrate suitable for human use is now being developed. A thorough assess be given high priority in any such investigation. This is strongly suggested by the high quality of the test samples of MPC produced in Seattle; the apparent entive ease with which harvesting of cultured mussels could be controlled to avoid danger from paralytic shellfish poisoning. [2 figures, 3 tables, 3 references] 1/Casein equal to 3.0.

liquid conditioner for horses, calves, cattle, dogs, and cats. The liquid cattle supplement contains fermented tuna broth with an abundance of brewers yeast and pure cane molasses. It is agitated and homogenized twice to ensure stability. cattle in pastures or feedlots--the cows lap it up by licking a feeder wheel that only enzymes and bacteria but growth factors as well. It is fed free choice to Although the catfish feed is receiving a great deal of attention because of the expansion of the catfish-farming industry, the firm continues to produce a The product is 35 percent protein and 96 percent digestible. revolves through the liquid.

acid, blackstrap molasses, vitamins, and minerals. It is distributed to consumers in small (about 1,300 gal.) tank trucks. Most buyers are dairymen, brood cattle shipped by tanker to Mobile, where it is homogenized with liquid urea, phosphoric The fresh fish broth, or stickwater, that is used in the latter product is obtained from three large tuna canneries in Puerto Rico. It is piped directly to a central fermentation plant, where it is mixed with molasses (a source of carbohydrates), brought from the sugar cane facilities at Mayaguez, and large quantities of yeast, obtained from a Puerto Rican brewer. The alcohol created during fermentation is distilled off and stored until the residue is concentrated by removal herdsmen, and feedlot owners who raise beef for slaughter. Rico's director of marketing believes that this feed supplement is one step toward satisfying the of moisture; then the alcohol is returned to the concentrate. This premix is urgent need for speeded-up beef production. [2 photographs]

IMPROVEMENT IN ANIMAL FEEDS 40 YEARS OF

Feedstuffs 41, No. 36, 220 pp. (September 6, 1969)

This 40th anniversary issue of Feedstuffs documents the growth of animal agribusiness and the contributions of the feed industries to the production of better this progress are highlighted in special articles. Among these articles are the foods at economical prices. Technological developments that have accounted for

"40 Years of Progress in Beef Cattle Nutrition," by W. M. Beeson (Purdue Uni-ity, Lafayette, Indiana). pp. 74, 146-148, 150, 152. (9 tables, 1 photograph, Lafayette, Indiana). pp. 35 references) versity,

"The Effect of Nutritional Discoveries Upon the Economy of Poultry Production Over the Past 50 Years," by M. L. Scott (Cornell University, Ithaca, New York). pp. 76-77, 152, 154. (17 tables, 4 photographs)

"Progress in Broiler Feed Formulation" [G. H. Arscott (Department of Poultry p. 80. (2 tables, 2 figures) Science, Oregon State University, Corvallis)]. "40 Years of Change in Layer Feeds and Feeding," by E. P. Singsen (University onnecticut, Storrs). p. 84. (1 figure, 1 table, 1 photograph) (over) Connecticut, Storrs). p. 84.

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Abstracter: L.

Baldwin

NEWER METHODS OF ASSESSING PROTEIN QUALITY

Bender, A. E. (Nutrition Department, Queen Elizabeth College, Campden Hill, Lon-Chemistry and Industry No. 27, 904-909 (July 5, 1969) don W.8, England)

But for a given purpose. That purpose may be growth, recovery, production of milk, or any number of other biological or chemical functions. The most direct way of such measurements are time consuming and expensive, and the growing interest in the quality of proteins, coupled with a growing demand for quality control in the factory, dictate the introduction of more rapid, reliable methods of assay. "Protein quality" is the term applied to the usefulness of a given protein course, would be to feed it to a test animal and then measure the function. determining the usefulness of a protein food for one of these purposes, of

tive value of proteins--assays for biological value, net protein utilization, and protein efficiency ratio--and gives their shortcomings. He shows how the change in approach from determination of overall nutritive values to determinations of available individual amino acids brought on a change in the methods of assay, and he describes and evaluates some of these methods. Then he describes and assesses chemical estimation of available lysine value, measurement of a protein's dyebinding capacity, microbiological assay of available amino acids, assay of amino The author reviews some of the methods most commonly used to test the nutriacids liberated by enzymic hydrolysis of the protein, use of the pepsin digest residue amino acid index, comparison of the biological values of a protein with the usefulness of eight of the newer methods of determining protein quality:

L. Baldwin Abstracter: COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12 PAGE 15 (OVEX) UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE.

SEMIMICRO METHOD FOR DETERMINING TOTAL LIPIDS IN FISH MEAL

(National Center for Fish Protein Concentrate, College Park, Maryland 20740) Journal of the Association of Official Analytical Chemists 52, No. Barbara J. Roche, and George M. Knobl, Jr. Ambrose, Mary E., (July 1969)

The purpose of the present study The methods of analysts of lipids in fish meal vary considerably. Also, the lipids of fish oxidize readily so that the data obtained by different methods may vary considerably when Information on the composition and quality of fish meal is needed to faciliwas to improve the Smith et al. method by reducing the amount of solvent used and used on fish meals containing oxidized lipids. Smith, Ambrose, and Knobl (1964) by changing the drying method so that the analysis can be completed in a shorter developed a method of extraction with chloroform and ethanol but the method is tate trade and utilization of such products. The consistency of such data may often depend upon the method of analyzing a given component. cumbersome and requires large amounts of solvent.

same number of samples requires 3 days by the present AOAC (Association of Official Analytical Chemists) method. Results are comparable to those derived by the AOAC Twelve samples can be completed in 1 day by the proposed method; the The authors developed a simple and rapid method for determining lipids in (over) fish meal.

COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO. 12 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

Piskur

F. T.

Abstracter:

PROXIMATE COMPOSITION OF COMMERCIAL FISHES FROM THE MEDITERRANEAN SEA AND THE RED SEA (1,0156,9,125)

Herzberg, A., and Rachel Pasteur (Sea Fisheries Research Station, Department Fisheries, Ministry of Agriculture, Haifa, Israel) Fishery Industrial Research 5, Nc. 2, 39-65 (July 1969)

of

interest in species of fishes that have not previously been marketed in signifi-The development of fisheries in subtropical and tropical areas has aroused fresh or a canned product or as fish meal, the authors determined the proximate cant quantities. Since some of these species doubtless have value either as a composition of 10 species native to the Mediterranean and the Red Sea.

fishes, coupled with the low concentration of oil in most of the demersal fishes, showed that the fishes in the area could be used as a source of fish protein concentrate (FPC). The authors prepared satisfactory samples of FPC from Nemipterus <u>japonicus</u> (threadfin bream) and <u>Saurida tumbil</u> (Red Sea lizardfish) in their laboratory. They used isopropanol for the extraction. Both types of FPC were al-The proportions of protein, oil, ash, and water in the fishes were examined year-round basis. The relatively high concentration of protein in all the most tasteless and odorless. on a year-round basis.

The wide changes in the concentration of oil in the pelagic fishes point to a need for a determination of the seasons when these and similar species would be most usable for canning. The authors suggest that such changes are probably re-Although no differences in chemical composition were lated to the spawning cycle.

(over) COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

L. Baldwin Abstracter:

The authors report the proximate analyses and lipid composition of three samples of zooplankton: two samples of krill (<u>Euphausia pacifica and E. superba</u>) and one of "red crab" (<u>Pleuroncodes planipes</u>), a galatheid decapod. Alverson (1967) postulated a potential annual harvest of 50,000 metric tons of krill; Pierce, Richard W., John Van der Veen, and H. S. Olcott (Institute of Marine Resources, Department of Nutritional Sciences, University of California, Berke-Journal of Agricultural and Food Chemistry 17, No. 2, 367-369 (March-April 1969) PROXIMATE AND LIPID ANALYSES OF KRILL (PLEURONCODES PLANIPES) [Abstracter: (EUPHAUSIA SPECIES) F. T. Piskur counterparts. phosphate esters do not interfere with the determination of free phosphate under the conditions of the assay. All reagents used are stable at room temperature. ducing agents, of a blue color by the phosphomolybdate complex). uses Triton X-100 (detergent) instead of reducing agents. Appare Eibl, Hansjörg, and William E. M. Lands (Department of Biological Chemistry, The The absorbance is measured at a convenient wavelength (660 nm).
[4 figures, 2 tables, 12 references]
[Abstracter] phosphorus (the basic method depends upon the development in the presence of re-University of Michigan, Ann Arbor 48104)
Analytical Biochemistry 30, No. 1, 51-57 (July 1969) of some of the recent and current work being done on protein quality. He brings problem is lack of a criterion for measuring the validity of any such tables, 50 references] the urea concentration in the blood of the animal to which the protein was fed, out some of the problems that must be solved before newer, shorter, more useful use of liver enzyme activity as a screening test, and assessment of changes in that they are new modifications of old methods. However, they are descriptive tests for protein quality can be introduced, and he points out repeatedly that The author recognizes that some of these methods are new only in the sense The report describes a new method for the spectrophotometric determination of A NEW, SENSITIVE DETERMINATION OF PHOSPHATE plasma levels following ingestion of the protein. [Abstracter: the major problem test. [3 tables, The new method F. T. Piskur]

rative study. By the proposed method, the lipids are extracted with chloroform and methanol--this extraction process takes about 10 minutes. [3 tables, 10 references] method. "Turkey Industry Goes From Farm Sideline to Highly Specialized Business," by R. C. Small (National Turkey Federation). pp. 86, 138, 140, 144. (5 photographs) "Turkey Feeds: 1969 vs. 1930" [P. W. Waldroup (Department of Animal Sciences, University of Arkansas, Fayetteville)]. p. 87. (2 tables, 1 photograph) "Special Allied Mills Swine Test - Daily Gain 24% Better on 1969 Diet," anon-State University, Ames)]. pp. 94, 134. (6 tables, 4 photographs)
"1929, 1969 Turkey Feeds Compared," by Jay O. Anderson (Animal Science Department, Utah State University, Logan). p. 96. (3 figures, 1 table)
"Comparative Study of Turkey Diets," by Larry G. Fanella and C. W. Carlson (Animal Science Department, South Dakota State University, Brookings). pp. 110p. 92. (1 figure, 2 tables, 4 photographs)

111, 115. (2 figures, 3 tables)
"A Story of Change: The Development of Poultry, Other Agribusiness in the South," by Robert H. Brown. pp. 106, 118-120. (1 photograph)
"Peeding Dairy Cows - Then and Now," by Louis L. Rusoff (Department of Dairy (3 photographs, Science, Louisiana State University, Baton Rouge). pp. 114-115.

the resulting elution patterns, they observed peaks of major component protein at each definite elution volume. The  $K_{\rm AV}$  values were 0.9 to 1.0, 0.4 to 0.5, and 0.0 to 0.1 for sarcoplasmic protein, myosin, and actomyosin, respectively. From these results, the authors conclude that fish muscle protein can be fractionated

into three kinds of proteins -- sarcoplasmic protein, myosin, and actomyosin (and/

or aggregated protein)--by gel filtration on Sepharose 2B. [3 figures, 1 table, 4 references]

[Abstracter: L. Baldwin]

The authors suggest that the recommended method be subject to a collabo-

(8.53)

AND RED CRAB

gel filtration on agarose gels. To interpret these elution profiles, they submitted sarcoplasmic protein and actomyosin prepared from fish muscle and myosin seen in the elution diagrams of fish muscle protein that had been subjected to

In 1968, the authors reported that several peaks of eluted proteins had been

prepared from both fish and rabbit muscle to gel filtration on Sepharose 2B. In

Bulletin of the Japanese Society of Scientific Fisheries 35, No. 6, 555-558 (June 1969) (In Japanese; summary, figures, and table in English)

lmemoto, Shigeru, and
ku, Tokyo, Japan)

"Broiler Ration Improvement Since 1942," by D. K. Potter and E. A. Blasing (The Pillsbury Co., Minneapolis, Minnesota). p. 167. (2 tables)
"Arkansas Trial Illustrates Changes in Broiler Results" [T. S. Nelson and "Supply of Feed Concentrates More Than Doubles in 40 Years," by Robert p. 168. (3 tables, 2 photographs) Tom Goodwin (University of Arkansas)].

pp. 213, 216-217. (3 tables, 2 graphs) numbers of this issue of the journal may be obtained for \$2 each from: Limited

species from the Red Sea seemed to be generally leaner than their Mediterranean found between the fishes from the Mediterranean Sea and those from the Red Sea, [20 figures, 12 tables, 20 references]

17 percent ash, and from 18 to 26 percent lipids. The red crab contained (dry weight basis) 32 percent protein, 36 percent ash, 8 percent lipids, and 11 percent chitin. A large proportion of the fatty acids in the lipids was highly unsaturated; C20:5 and C22:6 constituted 39 to 45 percent of the total. Saturated fatty acids constituted about 30 percent of the total. [2 tables, 31 references]

Zooplankton that might be used as food or feed. red crab in Pacific waters adjacent to Mexico. These species are examples of The krill samples contained, on a dry weight basis, about 53 percent protein,

Longhurst (1967) estimated a potential annual harvest of 10,000 metric tons of

10 tables, 7 references)

P.O. Box 1289, Minneapolis, Minnesota 55440.

GEL FILIRATION OF SARCOPLASMIC AND MYOFIBRILLAR PROTEINS ON SEPHAROSE 2B

Shigeru, and Koichi Kanna (Tokai Reg. Fish. Res. Lab., Kachidoki, Chuo-

STUDIES ON GEL FILTRATION OF FISH MUSCLE PROTEIN--II.

VARIATION OF THE MUSCLE PROTEIN IN HORSE MACKEREL

(1.11, 6.54)

Fish Jelly Processing Cooperative Association of Japan, Kanda Sakumacho, Chuochidoki, Chuo-ku, Tokyo, Japan), and Tuneji Yamamoto (National Federation of Suzuki, Taneko, Koichi Kanna (Tokai Regional Fisheries Research Laboratory, Ka-

No. 5, 451-458 (May Bulletin of the Japanese Society of Scientific Fisheries 35, ku, Tokyo)

tein were caused by such variables as fishing ground, method of catch, and season. Post-mortem changes in the physicochemical properties of myofibrillar protein after death and the protein that changes easily as post-mortem time progresses. However, the myofibrillar protein of horse mackerel (<u>Trachrus japonicus</u>) seems to fall somewhere between these two types. The authors conducted this study to see if the variations occasionally observed in the properties of horse mackerel profish have been classified into two types: the protein that changes little

tracts, crude fat content, and the gel-forming ability of the white meat were deactomyosin becomes lower and broader and the sedimentation velocity increases as Ultracentrifugal schlieren patterns, the flow birefringence of 0.6 M KCl exthe time after death progresses; gel strength remains high only when the muscle is fresh; (2) the peak of actomyosin remains very sharp and the sedimentation Four types of post-mortem change were observed: (1) the peak of

(over)

commercial fisheries abstracts  $\,$  vol. 22 no. 12 page  $\,17$  united states department of the interior, fish and wildlife service

NOVEL COMPOSITION OF PHOSVITINS FROM SALMON AND TROUT ROE

Baldwin

ŗ.

Abstracter:

Mano, Yoshitake, and Mihoko Yoshida (Department of Biochemistry, Faculty of Medi-8.51 (7.52, 1.35, 1.37)

amino acids was not universal. In the present paper, the authors report their findings about the composition of phosvitins from the roe of dog salmon (Oncorhyncus keta) and rainbow trout (Salmo irideus), and they describe the method by which they obtained their results. (This preparative method, they say, is applicable to all kinds of fish roe but not to other tissues or to hen eggs. Its yield is inance of serine and the modicum of certain other amino acids. Sulfur-containing However, the lack of aromatic fish species. The basic amino-acid composition was characterized by the predom-In 1966, Mano and Lipmann found that the phosvitins from a variety of fish roes had a similar amino-acid composition but differed in detail according to cine, University of Tokyo, Bunkyo-ku, Tokyo, Japan) Journal of Biochemistry 66, No. 1, 105-108 (July 1969) and aromatic amino acids especially were lacking.

The phosvitins obtained from the fractions having the highest phosphorus con-The data (see back salmon- and trout-roe phosvitins had the following moles of amino acid per molecule: lysine, 5; histidine, cysteine, valine, methionine, leucine, phenylalanine of card) show the similarity of salmon and trout phosvitins. Further, both tent were homogeneous in chromatograms and schlieren patterns. almost quantitative.)

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12 PACE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

Baldwin ľ. Abstracter:

"KATSUOBUSHI" VOLATILE NEUTRAL, NON-CARBONYL OXYGENATED COMPOUNDS CHEMICAL STUDIES ON COMPONENTS OF DRIED BONITO, PART II. Sasaki, Shigeru (Research Laboratories, T. Hasegawa Co., Ltd., Nihonbashi, Tokyo, Japan), Soichi Arai, Hiromichi Kato, and Masao Fujimaki (Department of Agricultural Chemistry, The University of Tokyo, Tokyo) Agricultural and Biological Chemistry 33, No. 7, 1037-1041 (July 1969) Japan), Soichi Arai, Hiromichi Kato, and Masao

nature of those components of Katsuobushi that contribute to the flavor of the The present paper reports on one aspect of a research program to determine the The paper deals with the estimation and identification of some free "Katsuobushi" is a dried seasoning prepared from bonito (Katsuwonus alcohols and of esters in Katsuobushi, product.

The flavor components of Katsuobushi were extracted with 80 percent ethanol. The distillate was separated into basic, acidic, phenolic, and neutral fractions. The neutral, noncarbonyl oxygenated fraction was analyzed by gas chromatography. The extract was concentrated under vacuum, then steam distilled.

following compounds were tentatively identified: The

Free alcohols: 2-pentanol and 2-methol-1-heptanol

Constituents of esters: n-butanol, isobutanol, n-pentanol, and n-dodecanol; the carboxylic acids--propanoic, n-butanoic, n-pentanoic, n-octanoic, n-decanoic, n-dodecanoic, n-tetradecanoic, (over) and n-hexadecanoic.

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

F. T. Abstracter:

NUCLEOTIDE DEGRADATION IN FROZEN SWORDFISH MUSCLE

8.8 (2.03)

Journal of the Fisheries Research Board of Canada 26, No. 6, 1597-1603 (June 1969) Dyer, W. J., and Doris I. Hiltz (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)

In the same fish, Ino accumulates with very slow formation of Hx, showing The measure of the extent of the postmortem degradation of nucleotides in fish has been used as an index of quality of the fish. The degradation sequence is adenosine triphosphate — inosine monophosphate (IMP) — inosine (Ino) — hyp xanthine (Hx). The value of the measure of these compounds as a quality index would depend upon the stability of these compounds during frozen storage of the fish. Dyer et al. (1966) noted that IMP degraded slowly in swordfish stored at -4° C. In the same fish, Ino accumulates with very slow formation of Hx, showin that Ino ribohydrolase activity is lower than that of the IMP phosphohydrolase. Also, the rates are affected very little by the initial quality of the fish, gesting that endogenous enzymes -- rather than bacterial enzymes -- are involved.

In the present study, the authors determined the nucleotide degradation rates in frozen swordfish steaks stored at -26°, -18°, and -8° C. and compared the values obtained with taste-panel assessments of the quality of the steaks.

C., respectively. LMP dephosphorylation was active in swordfish steaks stored at -8° C. but less active in steaks stored at -18° C. The rates of loss were about 0.24 and 0.029 µmoles of LMP per gram of fish per week at -8° C. and -18° C., respective

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12PAGE 17 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

Piskur E--i jz, Abstracter:

Phosvitin characteristic Salmon Trout
Nelecular weight 19,000:500 19,350±550
P content (%) 95 alkali labile P (%) 95 serine content (µmoles/mg.) 3.54 3.57

The authors conclude that the amino-acid composition and the other properties it the phosvitins from these related fishes show minimal species differences. [3 figures, 1 table, 16 references]

[Abstracter: F. T. Piskur]

[4 references]

Whirling disease, a serious problem in the intensive rearing of salmonid fish in Europe, was found in Scotland in October 1966. The etiological agent of the disease, the myxosporidian protozoan parasite Myxosomma cerebralis was identified in rainbow trout (Salmo gairdneri) from two trout farms. The causative parasite had not been identified previously in Great Britain. The author postulates that the disease may have already existed in wild populations before the present diagnosis, but it is also possible that the spores of M. cerebralis may have been introduced into Scotland via egg packing materials.

Elson, K. G. R. (Department of Agriculture and Fisheries for Scotland, Marine Laboratory, P.O. Box 101, Torry, Aberdeen, Scotland)
Nature 223, No. 5209, 968 (August 30, 1969)

WHIRLING DISEASE IN TROUT

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welocity remains almost constant for a long time after death; gel strength remains very high even if the muscle is not fresh; (3) the peak of actomyosin becomes low and broad but the sedimentation velocity remains unchanged as the time after death increases; gel strength remains high only when the muscle is fresh; and (4) the peak of actomyosin is broad and low even in very fresh muscle, almost disappearing as the muscle ages; a gel will not form no matter how fresh the muscle may be. The fishing ground, the fishing method, or the season apparently has no clear-cut influence on any of these properties.

The observations resulting from these experiments seem to coincide with those of many makers of frozen surimi (fish meat paste). Although the smaller the quantity of type 4 protein in a surimi mixture the better the fish jelly, distinguishing the different types of horse mackerel merely by external appearance is very difficult. The authors question whether or not horse mackerel with these different muscle properties actually contain different kinds of protein, for the reason for the many variations is still unknown. One hypothesis advanced is that the protein from one fish has the same physicochemical properties as that from another but some cathepsin contained in the muscle of one may have a different kind of activity from that of another; thus the muscle proteins may be affected in different ways. [5 figures, 4 tables, 5 references]

8.8

proline, glycine, 4; alanine, 3; and tyrosine, 1. Both contained 2 moles of glucosamine

per molecule; neither showed

signs of uronic acid.

tryptophan, 0; glutamic acid,

Some loss of IMP occurred in steaks stored at -26° C. during a 2-year period. Inorbibdyclase was less active, but about 2.5  $\mu$ moles of Hx per gram of fish accumulated after 2 years of storage of the steaks at -8° C. Taste-panel scores indicated that the storage life of swordfish was 3 months at -8° C., 9 months at -18° C., and several years at -2° C. The loss of IMP was slightly slower than the relative decrease in associated taste-panel scores.

The authors suggest that the IMP level is not a good indicator of the quality of frozen swordfish. Possibly the strong flavor of the swordfish obscures any loss in flavor resulting from the decrease in IMP. Hx level may be used as a index of prefreezing quality because it forms slowly at low-storage temperatures; however, red must not be used in the sample because it has a high initial content of Hx (about 1.9 µmoles of Hx per gram of red muscle).

This paper presents a simple method, adapted for gas chromatographic determinations, for the extraction of pentachlorophenol (PCP) in soil, water, and fish. PCP can be detected down to 0.5 p.p.b. in soil or fish and down to 0.01 p.p.b. in water. [4 figures, 2 tables, 17 references] [Abstracter: F. T. Piskur]

Stark, Ake (Institute of Analytical Chemistry, University of Stockholm, Stockholm, Sweden)

Journal of Agricultural and Food Chemistry 17, No. 4, 871-873 (July-August 1969)

ANALYSIS OF PENTACHLOROPHENOL RESIDUES IN SOIL WATER, AND FISH

2-Methyl-1-heptanol exhibits a fresh woody aroma and seems to provide the major contribution to the flavor of Katsuobushi. [6 figures, 2 tables, 7 references]

Because such mucopolysaccharides as hyaluronic acid and chondroitin sulfate are usually found in tissues of fish, the authors assumed that hyaluronidase would also be there. The search for this enzyme was the subject of the experiment reported here. Hyaluronidase action was found in the tissues of the heart, liver, stomach, pyloric ceca, intestine, skin, kidney, ovary, and testis (singly or in combinations) of the following fish and shellfish: bonito, Sarda oxientalis; yellowtail, Seriola quinqueradiata; mackerel, Scomber japonicus; perch, Lateolabrax japonicus; eel, Anquilla japonicus; carp, Carpinus carpio; rainbow trout, Salmo gairdneri irideus; red spin ray, Dasyatis akajei; squid, Ommato-strephes sloani pacificus; poray, Chrysophrys major; top shell, Turbo (Battillus) cornutus; and crab, Neptunus trituberculatus. The authors noted a large amount of hyaluronidase in extracts from the stomachs of yellowtail, rainbow trout, poray, eel, and carp, all carnivorous fish. Since the property of bacterial hyaluronidase was different from that of the fish stomach enzyme, the authors concluded that the bacterial enzyme was not the cause of the enzyme action in the stomach extracts. [1 figure, 3 tables, 8 references] [Abstracter: L. Baldwin]

Kitamikado, Manabu, and Hiroshi Yamamoto (Lab. Fish. Tech., Kyushu Univ., Fukuoka Japan)

Bulletin of the Japanese Society of Scientific Fisheries 35, No. 5, 466-470 (May 1969)

(0.2)

(Department of Food Science and Technology, Oregon State University, Corvallis 97331) Harrison, Janice M., and J. S. Lee

Applied Microbiology 18, No. 2, 188-192 (August 1969)

Little information is available on the microbiological aspects of commercially produced Pacific shrimp, (Pandalus jordani). The industry in Oregon and Washing-ton is relatively new, and data on the microbiology of Pacific shrimp provide the basis for maintaining and improving quality control practices.

Samples of shrimp were selected from five key points in the processing line, including samples of shrimp taken just before the product was packaged. Standard bacteriological procedures were used before the product was packaged. Standard bacteriand were identified in the literature references. Two plants were selected for the test.

The microbial load on the shrimp The microbial count of the shrimp taken at five key locations in the processing line ranged from 1.3  $\times$  10 to 3.0  $\times$  106. The microbial flora of the initial Acinetobacter-Moraxella, Flavobacterium, shrimp sample (the shrimp in the boxes delivered from the vessel) consisted of Pseudomonas, gram-positive cocci, and Bacillus species. No yeasts were found. Differences in processing procedures between the two plants were reflected in both total microbial count and microbial flora. The microbial load on the shr. (in decreasing order of predominance):

COMMERCIAL FEHERIES ABSTRACTS VOL  $22\,$  NO  $12\,$ PAGE  $19\,$ United states department of the interior fish and wildlife service

F. T. Piskur Abstracter:

## SYMPOSIUM ON IMPORTANCE OF NONVOLATILE COMPOUNDS IN FLAVOR

Journal of Agricultural and Food Chemistry 17, No. 4, 677-746 (July-August 1969)

sented; those of direct interest to commercial fisheries are reported as follows: The symposium was presented at the 156th Meeting of the American Chemical Society, Atlantic City, New Jersey, September 1968. Fourteen papers were pre-

grances, Inc., Union Beach, New Jersey 07735), pp. 681-685. Lipids may serve as precursors in their contribution to the flavor of foods. "Role of Lipids in Flavors," David A. Forss (International Flavors & Fra-

lipids contribute to flavor largely through stimulation of the sense orthe mouth. Lipids modify the taste and flavor of other compounds in food particularly those of low polarity. Lipids also modify the physical state of the food and, in turn, may affect the movement of compounds to the taste and odor Free fatty acids formed by hydrolysis, aldehydes formed by oxidation of unsaturated fatty acids, and ketones from oxidized lipids may contribute to desirable flavors and to undesirable flavors. The intact lipid or the low breakdown prod-[4 figures, 40 references] the mouth. receptors. ucts gans

"The Taste of Amino Acids, Peptides, and Proteins," Juerg Solms (Institute of Agricultural Chemistry, Swiss Federal Institute of Technology, 8006 Zurich, Switzerland), pp. 686-688.

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12 PAGE. 19. UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

F. T. Piskur Abstracter:

SYMPOSIUM ON IMPORTANCE OF NONVOLATILE COMPOUNDS IN FLAVOR

Card 2

8.8

4, 677-746 (July-August 1969) No. Journal of Agricultural and Food Chemistry 17,

bolites," N. R. Jones (Tropical Products Institute, 56-62, Gray's Inn Road, London, England), pp. 712-716. Significance of Ribomonoucleotides and Their Meta-"Meat and Fish Flavors.

precursing qualities of ribomonoucleotides and their metabolites by reaction with This review paper covers: (1) The natural tastes of ribomonouncleotides and properties of ribomononucleotides and their breakdown products and the composite nucleotides as key biochemical determinants of concentrations of other flavorous products, particularly hypoxanthine as indices of freshness and quality of meat and fish products. [75 references] their breakdown products, separately and in mixtures, (2) the flavor-enhancing compounds, and (5) the estimation of 5'-ribomonouncleotide and their breakdown effects of these compounds in the presence of other compounds, (3) the flavorother groups of compounds during cooling, processing, and storage,

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

Piskur Ë ČE, Abstracter:

### RUSSIAN APPROACH TO OIL POLLUTION

New Scientist 43, No. 663, 389 (August 21, 1969)

tive, biologically harmless, chemical compound (unnamed) is being tested at Odessa Shortly after the <u>Torrey Canyon</u> incident, the Soviet Union held a competition for new ways of combatting oil pollution. Of the more than 200 ideas submitted, most seem to be mechanical rather than chemical, though a new and highly effec-

the scoop. All operations are mechanized, so the boat requires a crew of only two. collects floating debris and oil of any viscosity (up to 2 m. long and 70 kg. in weight) from the surface of the water. At the prow, the boat is fitted with rotating shields that provide for a scooping width of up to 8 m. Although she is comparatively small (14.85 m. long, 4.3 m. wide, 2 m. in hull height, and 1.6 m. being scooped up, the oil enters a receiving and settling bath, where it is sep-One of the mechanical means being tested and developed involves a boat that High viscosity oil arated from the debris. The layer of oil that settles in the bath is pumped to other tanks for further separation and eventually transfer to shore; the debris that cannot be handled by the pumps in cold weather is loaded mechanically into in average draft), her collecting capacity is quite large--about 15 m.3 of oil and 4 m.3 of debris. She is quite maneuverable and can move at 3.8 knots. Upo is loaded into a removable scoop and lifted ashore by crane.

ships. To make the cleaning operation faster and more effective, a device made The Soviet Union is presently building -- on a large scale -- floating cleaner ships for use in washing out oil tankers and the fuel reservoirs of dry-cargo

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12PAGE 19 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

Ľ, Abstracter:

The common amino acids have the following taste properties near neutrality:

No taste or a barely perceptible taste: D-alanine, D- and L-arginine, D- and
L-aspartic acid, D-glutamic acid, L-histidine, D- and L-isoleucine, D- and L-ly-Sweer taste: D-tryptophan, D-histidine, D-phenylalanine, D-tyrosine, D-leusine, D- and L-proline, D- and L-serine, D- and L-threonine, D- and L-valine.

L-alanine, and glycine.

Sulfurous taste: D- and L-cysteine and D- and L-methionine. L-Glutamic acid has a unique taste-potentiating property. The contributions Bitter taste: L-tryptophane, L-phenylalanine, L-tyrosine, and L-leucine.

of amino acids, peptides, and proteins to the flavor of food products often exceed the taste properties of the pure compounds. [2 tables, 55 references]

"The Contribution of Peptides and Amino Acids to the Taste of Foodstuffs," Jiro Kirimura, Akira Shimizu, Akimitsu Kimizuka, Tsunehiko Ninomiya, and Noboru Katsuya (Central Research Laboratories, Ajinomoto Co., Inc., Kawasaki, Japan),

Amino acids are used in food proressing not only to enhance the nutritive value of certain foods but also to enhance or to improve the flavor of many foodor monosodium glutamate-like. The tastes of peptides were characterized as sour, The buffer action of amino acids also contributes to the taste of foodstuffs. The tastes of individual amino acids were characterized as sweet, salty, bitter, stuffs. Some specific patterns of amino-acid mixtures intensify the taste of foodstuffs and increase the "mouthfulness" without losing their inherent tastes. Some amino acids themselves contribute to the inherent tastes of food-[9 figures, 12 tables, 13 references] bitter, or practically tasteless.

always increased after the peeling and sorting operations and decreased after the cooking, washing, and brining steps. Gram-positive cocci counts, generally, increased after each processing step; most of these cocci, however, were gram-nega-

The authors point out that simple variations in processing practices can influence the microbial aspect of shrimp products. Cooking and washing significantly reduce bacterial loads on shrimp during processing. Judicious use of these steps would help improve the microbial quality of the products. [1 figure, 2 tables, 16 references]

pying the area. Maximum residues of the herbicide appeared in oysters snow after the area had been treated; they disappeared fairly rapidly, however. dangers of releasing large amounts of soft bottom sediment by uprooting and recausing an unacceptable level of mortality in the fauna and the other flora occumoving the eelgrass are discussed. acid equivalent per acre, the authors effectively controlled eelgrass without percent 2,4-D absorbed in small clay particles at a concentration of 30 lb. 2,4-D Using a granular formulation of 2,4-D BE consisting of the equivalent of 20 Maximum residues of the herbicide appeared in oysters shortly [Abstracter: L. Baldwin]

Stud. Fish. Res. Bd. Can., 1968, Pt. 1, pp. 167-174

Journal of the Science of Food and Agriculture 20, No. 6, 1-437 (June 1969)

(9.19, 1.81)BUTOXYETHANOL ESTER OF 2,4-D IN THE CONTROL OF EELGRASS (ZOSTERA MARINA L.) AND ITS EFFECTS ON OYSTERS (CRASSOSTREA VIRGINICA GMELIN) AND OTHER BENTHOS

purpose. A device fitted with special plugs having stopper faucets makes bunker-ing by gravity possible; thus fuel will not overflow from tanks that are too full. A submersible underwater pump operated by a pneumatic drive makes it possible to tional standards for the area can pump their polluted water or their oil through of flexible hoses fitted with a large number of special nozzles is used. Ships whose separators do not clean overboard discharges to the level set by internapump petroleum products that cannot be handled by the ship's pumps into a sepaspecial pipelines into accumulating tanks that have been set up ashore for the rator rather than into the sea. sources. [4 tables, 73 references] This publication will facilitate planning, coordination, and integration of State, Federal, and other activities concerned with the commercial fishery re-[Reprinted in part]

administrators, Federal people, project personnel, and others concerned with research, development, conservation, and management of our commercial fishery resources with a convenient reference to the Bureau of Commercial Fisheries grantin-aid program. Information presented is intended to provide State program coordinators and

ject activities under the Federal Aid Program of the Bureau of Commercial Fisheries. It covers fiscal year 1969. <u>Introduction.</u>--This is the second of a series of annual publications on proU.S. Fish and Wildlife Service Circular 322, 76 pp. (July 1969) Anonymous (Division of Federal Aid Staff)

FEDERAL AID PROGRAM ACTIVITIES 1969 BUREAU OF COMMERCIAL FISHERIES

(9.6)

QUALITY CONTROL

Quality Control in the Food Industry, Volume 2 Herschdoerfer, S. M. (ed.)

Published by Academic Press Inc. (London) Ltd., Berkeley Square House, Berkeley Square, London WIX 6BA. 440 pp., indexed, price 110s. (n.d.) Food Manufacture 44, No. 7, 82 (July 1969)

In volume 1 of this work, the general aspects of quality control are discussed. In volume 2, authors known to be expert in particular fields were asked to write product--for example, the selection of raw materials, the processing and storage methods used, the packaging employed, and the distribution system. The fishery articles covering quality control in their field. They were asked to treat the subject as the sum of all those controllable factors that affect the finished subjects covered are:

water - by R. C. Hoather and E. English

L. Baldwin] [Abstracter: fish and fish products - by C. L. Cutting and R. J. Spencer edible fats and oils - by A. P. Van Der Vet. [Abstr

homogeneous dough containing from 20 to 35 percent (by weight) raw or smoked fish, a greater amount of potato, and flavoring additives. It may be cooked before it is frozen.

[Abstracter: L. Baldwin] A new fryable fish product consists of a frozen block (or frozen chips) of a

Goodwin, H. H., and E. P. Sidaway (inventors) Journal of the Science of Food and Agriculture 20, No. 6, 1-458 (June 1969) White Fish Authority and Herring Industry Board (patentees) British Patent 1,132,389

FOOD PRODUCT

#### FICH TECHNOLOGY EXPERITENT STATION holge Bazcar, M. ACALORE-1

HEAT GELLING PROPERTIES OF MYOSIN, ACTIN, ACTOMYOSIN AND MYOSIN-SUBUNITS IN A SALINE MODEL SYSTEM

0.32

Samejima, K., and Y. Hashimoto (The College of Dairy Agriculture, Nishinipporo,

Ebetsu, Hokkaido, Japan), T. Yasui, and T. Fukazawa (Department of Animal

Science, Faculty of Agriculture, Hokkaido University, Sapporo, Hokkaido) Journal of Food Science 34, No. 3, 242-245 (May-June 1969)

valuable to the manufacturer of cured meat products such as sausages, because the binding and water-holding properties of meat, when cooked, appear to be important factors that influence quality of the product. This paper reports on a study of the heat-gelling properties of isolated myosin, actin, and actomyosin in saline model systems. Such information is

gelation of myosin, actin, and actomyosin, and of heavy and light meromyosins Myosin and actin were isolated from the skeletal muscle of the rabbit.

derived from myosin by treatment with trypsin, by heat was observed in various systems.

Apparently the gelling properties of these proteins do not run parallel to those of saline model system composed of these proteins and stroma. Actin does the resulting binding properties are con-[Abstracter: F. T. Piskur] not exert any influence on the binding properties of the system; however, when siderably improved. Because heavy and light meromyosins have little influence on binding properties, the authors conclude that an intact molecule of myosin is required for development of binding properties upon heating. [6 figures, 24 references] F actin and myosin A are both present,

COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 12 PAGE 21 UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE

RAPID TECHNIQUE FOR ENUMERATION AND ISOLATION OF PEROXIDASE-PRODUCING MICROORGANISMS Bordeleau, Lucien M., and Richard Bartha (Department of Biochemistry and Microbiology, Rutgers, The State University, New Brunswick, New Jersey 08904) Applied Microbiology 18, No. 2, 274-275 (August 1969)

the researchers designed and applied a rapid technique for the enumeration and iso-Peroxidases (enzymes that catalyze the dehydrogenation of various substances in the presence of hydrogen peroxide) are widespread in plants, animals, and microdases in soil were implicated in the production of azo compounds from the aniline-Bartha and Bordeleau (in press) showed that peroxilation of peroxidase-producing soil microorganisms. The present paper reports on peroxidases of microbial origin and the formation of azobenzenes in natural soil, residues of certain herbicides. In that study of the possible relation between organisms and have been shown to perform the oxidative condensation of certain phenols and aromatic amines. this technique.

Peroxidase-positive microorganisms were enumerated on agar plates by use of a p-anisidine-H2O2 spray. The same technique, using replicated plating, can be used to selectively isolate the peroxidase-producing microbial cultures. The

technique is simple, rapid, and reliable.
[1 figure, 1 table, 6 references]

[Abstracter: F. T. Piskur]

DWINDLING HADDOCK NOW UPSTAGED BY POLLOCK IN NORTHWEST ATLANTIC (1.52, 1.0115, 1.01111)

Quick Frozen Foods 31, No. 12, 99-100 (July 1969) Anonymous

must be trained to operate the equipment. Thus the total cost of conversion comes to about \$50,000. As a result, ex-haddock fishermen are asking the Federal government to underwrite part of the cost because of their condition as a distress Northwest Atlantic Fisheries, meeting in Warsaw in June, recommended a closed season during March and April of 1970-1972 and catch quotas of 12,000 metric tons (2) New England and Canadian fishermen are converting their The costs of converting off-bottom trawlers is relatively cheap--\$3,000 or \$4,000 on Georges Bank and 18,000 metric tons on Browns Bank, off Nova Scotia. Fishervessels so they can fish for pollock as a replacement for the dwindling haddock. In 1965, the catch of haddock in the Northwest Atlantic was 155,000 metric tons. In 1968, it was 45,000 tons. In 1970, it is expected to be 14,000 tons. This condition has had two results. (1) The International Commission for the les scientists would have preferred complete closure of the fishery in order to But, since pollock swim at midwater levels rather than near the bottom, as haddo, expensive electronic gear is needed to find and catch them, and crews replenish the stock.

source is said to be able to easily support an annual catch of 200 million lb. year without the supply's being damaged. Pollock tastes almost like haddock, its meat having a fine texture. The

L. Baldwin]

[Abstracter:

[2 photographs]

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12PAGE 21 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

STUDIES ON THE FISHING MECHANISM OF TUNA LONG-LINE--I. RELATION BETWEEN CATCH AND SIZE OF THE GEAR (1.12, 2.12) Hirayama, Nobuo (Tokyo University of Fisheries, Konan-4, Minato-ku, Tokyo, Japan) Bulletin of the Japanese Society of Scientific Fisheries 35, No. 6, 546-549 (June 1969) (In Japanese; summary and figures in English)

2) The relation between the behavior of tuna and the characteristics of the tuna longline (the size of the gear: the hook intervals, and the length of the main-line, the branch line, and the float line) is studied in the light of data obfor the bait, d = the distance between hooks, and r = the radius of an estimated tained from longliners using various sizes of gear. Two equations were derived to express the results:  $C = st \times d$  (when d < r); and  $C = st \times 2r$  (when d > r). (C the catch, s = the density of the school in a fishing ground, t = the soak time spherical area within which the fish are likely to be attracted.) The depth at which the hooks are suspended has virtually no effect on the catch.

top and bottom walls of a freezing tunnel. needed between the successive turns of the helical path, which correspond to the [Abstracter: [Abstracter: L. Baldwin]

[8 figures, 2 references]

L. Baldwin]

can be compact. Moreover, the amount of insulation is small, since none is Modern Refrigeration and Air Conditioning 72, No. 857, 67 (August 1969) Since materials to be frozen are conveyed in a helical path, the apparatus

British Patent 1,147,558 FREEZING APPARATUS

Brodrene Gram, A/S, Vojens, Denmark (pat.)

commercial fisheries abstracts  $\,$  vol.  $22\,$  no.  $12\,$  page  $\,21\,$  united states department of the interior, fish and wildlife service

Commercial fisheres abstracts  $\ \, \text{VOL} \ 22 \ \text{no} \ 12 \, \text{page} \ 21$  united states department of the interior, fish and wildlife service

### CATION INTERACTIONS AND BIOCHEMICAL COMPOSITION OF THE CELL ENVELOPE OF A MARINE BACTERIUM

De Voe, Irving W., and Evelyn L. Oginsky (Department of Microbiology, University of Oregon Medical School, Portland 97201)
Journal of Bacteriology 98, No. 3, 1368-1377 (June 1969)

purpose of this study was to define more clearly the roles of Na+ and in the isolated envelopes of a marine bacterium.

MgCl2, and 1.0 M NaCl. After exposure to MgCl2, both types of envelopes remained intect in distilled water after exposure to 1.0 M NaCl, envelopes of the marine isolate fragmented in distilled water, but the envelope of the terrestrial Comparisons were made of the susceptibility of a marine isolate and of a terrestrial isolate to disintegration in distilled water after exposure to 0.05 M acid content of the envelope of the terrestrial isolate was twice that of the enmarine isolate occurred on the addition of MgCl2. The envelopes of the marine isolate contained lipopolysaccharide, muramic acid, and a variety of phospholipids. The amino-acid distributions in the acid hydrolysates of the envelopes isolate did not. Partial reaggregation of the fragments of the envelope of the [Abstracter: F. T. Piskur] of the marine isolate and the terrestrial isolate were similar, but the amino-[8 figures, 4 tables, 28 references] velope of the marine isolate.

Chemical Abstracts 70, No. 12, 49061e (March 24, 1969) Abbasov, D. R. (U.S.S.R.)

FROM CASPIAN SEA WATERS

FOR PREPARING NATURAL SODIUM SULFATE BY A BASIN METHOD POSSIBLE INDUSTRIAL USE OF APSHERON SALT LAKES

#### IN SPECIAL COMPARISON WITH D-GLUCOSE-GLYCINE REACTION OF BROWNING DEGRADATION OF D-FRUCTOSE MECHANISMS

Kato, Hiromichi, Mitsuyoshi Yamamoto, and Masao Fujimaki (Department of Agricultural Chemistry, The University of Tokyo, Japan)
Agricultural and Biological Chemistry 33, No. 6, 939-948 (June 1969) The mechanism of the browning reaction involving the fructose-amino acid systs unexplained. Hodge (1953) observed that the browning reactivity of present paper reports on a study of the degradation mechanisms of D-fructose with with amino acids was somewhat stronger than that of D-glucose. Also, amino acids in an aqueous system were considerably less than the yields of fructhe yields of aldoseamino acids and of fructoseamino acids from D-fructose and toseamino scids from D-glucose and amino acids (Anet and Reynolds, 1957). The or without amino acids or organic acids in aqueous solution in comparison with the D-glucose-glycine reaction.

by catalytic action of carboxylate anions (without condensation with amino groups), fructose degradation and the glucose-glycine reaction. D-Fructose browned more intensely than did D-glucose in the lower concentrations of glycine. D-Fructose, to a lesser extent, it formed pyruvaldehyde through caramelization. The authors believe that the main path of fructose degradation was 1,2-enolization but 2,3decomposed to 3-deoxy-D-erythrohexosulose, 5-(hydroxymethyl)-2-furaldehyde and, The researchers found substantial difference between the mechanism of the enolization occurred to a small extent. [7 figures, 5 tables, 33 references]

F. T. Piskur] [Abstracter:

#### STUDIES ON THE FISHING MECHANISM OF TUNA LONG-LINE -- II, RELATION BETWEEN SETTING COURSE OF THE GEAR AND MOVING DIRECTION OF THE FISH 2.1473 (1.12, 2.12)

Hirayama, Nobuo (Tokyo University of Fisheries, Konan-4, Minato-ku, Tokyo, Japan) 550-554 (June Bulletin of the Japanese Society of Scientific Fisheries  $\overline{35}$ , No. 6, 1969) (In Japanese; summary, figures, and table in English) In the operation of a tuna longline, the fisherman will have very good catches if he sets his line so as to intersect the school at a right angle to the direction of its movement. In this paper, the author treats the relation between the movement of the fish and the direction of setting the longline. He assumes that (1) the catch (F) is proportional to the number of fish (S) that encounter the longline, and (2) the school is moving in a certain definite direction at a constant speed (v). On the basis of these assumptions,  $S=Nv/\sin \theta^{\Gamma}L$ , where N is the density of fish in the fishing ground,  $\theta$  is the angle of fish movement against the longline. F was derived by the following equation: F = alwisin gfl, where a the longline, T is the mean soak time of the gear, and L is the total length of

From the equation for catch and the data for current direction, moving directhe most effective setting for the gear is in a direction normal to the current. [5 figures, 1 table, 2 references] Since most tuna move against the current, is the catch rate of an individual piece of gear. tions of the schools were estimated.

#### MEASUREMENT OF POWER

Commercial Fishing 8, No. 4, 10 (April 1969) Anonymous

Problem .-- Skippers, owners, and engineers need to know how much power is bethe engine and the hull, on the amount of fuel being consumed, and on the effidelivered to the propeller so that they can keep check on the condition of Also, such knowledge is needed ciency at which the vessel is being operated. Also, sur when specifications for new vessels are being drawn up.

The system has been successthat incorporates foil strain gauges, wrap-on slip rings, and d.c. energizers. It can be fitted to existing propeller shafts, or it can be inserted in the form a specially precalibrated torsion meter into new shafts. The equipment costs designed and tested a cheap, simple, reliable torsion meter for measuring proabout \$1,000--\$600 for the components that are fitted to the shaft and \$400 for It has proved capable of maintaining calibration peller shaft power. The basic system consists of a simple strain-gauge bridge for several months under the most arduous conditions, even in Arctic and North Solution. -- The Industrial Development Unit of the White Fish Authority has fully used on vessels ranging in size from a 70-ft. seine netter to a 240-ft. the indicating instrument that is connected to them. distant-water stern trawler. Atlantic waters.

vited to write to the Head of the Industrial Development Unit, White Fish Author-ity, South Side, St. Andrew's Dock, Hull, East Yorkshire, England. Owners, engineers, or designers who wish to obtain further details are in-

Baldwin] Γ. [Abstracter:

F. T. Piskur]

[Abstracter:

FROZEN FOOD PACKER'S SPECIAL GUIDE TO SPICES IN PREPARED FOODS 2.8 (3.235)

No. 12, 91-94 (July 1969) Quick Frozen Foods 31,

researchers that they find it necessary to add their own seasoning before serving frozen food packers compare the seasoning combinations they are now using with those used in some less well-known recipes, and (3) provide a source of new prodfor crab gumbo (Bahamas), clams oreganata (Italy), shrimp curry (India), bouillauct ideas. Among the recipes (and the country of origin) in the chart are those manufactured convenience foods, the author, with the help of the American Spice mainly in their flavor, and that some 60 percent of homemakers have told market Recognizing that most dishes from other lands differ from American dishes Trade Association, has assembled a foods spice chart to (1) help the American housewife vary her menus and bring new interest to the dinner table, (2) help baise (France), and shrimp luau (Hawaii).

Readers may get the full recipe for the dishes on the chart by requesting it, by name, from the Information Bureau, American Spice Trade Association, Empire

State Building, New York, New York. [1 chart, 2 photographs]

L. Baldwin] [Abstracter:

COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 12 PAGE 23 UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE

NUTRITIVE COMPOSITION OF IRRADIATED GULF OYSTERS STORED IN ICE

Science and Technology, Louisiana State University, Baton Rouge 70803) Journal of Agricultural and Food Chemistry 17, No. 4, 764-766 (July-August 1969) Liuzzo, Joseph A., Stephen C. Lagarde, and Arthur F. Novak (Department of Food

tic, chemical, and bacteriological criteria. The present study was carried out to determine the effect of irradiating Gulf oysters at the dose level recommended by Novak on the stability of the contents of moisture, ash, glycogen, crude protein, nonprotein nitrogen (NFN), true protein, crude fat, and soluble sugar. The oysters were treated in each of three ways: control (nonirradiated), irradiated at 0.2 Mrad with Go<sup>60</sup>, and irradiated at 0.4 Mrad. The samples were of 0.2 Mrad could be satisfactorily preserved from the standpoint of organolep-Novak et al. (1966) reported that Gulf oysters irradiated at a dose level

stored in ice. Samples were analyzed at 0-, 5-, 10-, 15-, and 20-day intervals.

When the crude protein values were converted to true protein values, the signi-Only the crude protein content was significantly affected by irradiation. ficance of the decrease was lost. Ash content (of control and irradiated samples) decreased significantly as storage time increased. These restrengthen the feasibility of irradiation preservation of oysters. [8 tables, 21 references]

[Abstracter: F. T. Piskur]

COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 12 PAGE 23 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

DETERMINATION OF TOTAL NITROGEN BY MICROCOULOMETRIC TITRATION (7.599)

IN WATER

Moore, Robert T., and James A. McNulty (Dohrmann Instruments Co., 1062 Linda Vista Environmental Science and Technology 3, No. 8, 741-744 (August 1969) Avenue, Mountain View, California 94040)

For example: (1) the level of nitrogfor treatment; and (3) nitrogen-containing pesticides in drainage waters (2) the total nitrogen (and ammonical nitrogen) in sewage must be determined as enous contaminants in streams must be monitored so pollution can be controlled; In many situations relative to the commercial fisheries, we must know the total nitrogen content of a water system. must be measured for pesticide control a basis

nitrite nitrogen. The purpose of this study was to develop a procedure for the ganic, nitrate, and nitrite nitrogen but does not give a clear recovery of the determination of total nitrogen including both organic and inorganic nitrogen, The modified Kjeldahl procedure (A.O.A.C., 1960) includes the ammonia,

The authors describe a system for measuring total nitrogen content in water down to 0.2 p.p.m. nitrogen in under 10 minutes. The water sample is pyrolyzed over a granular nickel catalyst in a stream of humidified hydrogen. The bound nitrogen in the sample is quantitatively converted to ammonia and the ammonia subsequently titrated electrochemically in a pH-sensitive cell.

T. Piskur] <u>C-4</u> [Abstracter: [5 figures, 2 tables, 5 references]

commercial fisheries abstracts vol. 22 no.12 page. 23 united states department of the interior, fish and wildlife service

TRITIUM LABELING OF PROTEINS BY THE FREE-RADICAL INTERCEPTOR METHOD WITH THE ALD OF ELECTRICAL DISCHARGE

White, Frederick H., Jr., Barbara Hauck, Hideo Kon, and Peter Riesz (National Heart Institute, National Institute of Arthritis and Metabolic Diseases and National Cancer Institute, National Institutes of Health, Bethesda, Maryland 20014)

Analytical Biochemistry 30, No. 2, 295-299 (August 1969)

use in the preparation of tritium-labeled proteins. Gamma irradiation, however, presents a hazard and is expensive. The purpose of the present study was to find The free-radical interceptor method (Riesz and White, 1968) is used for the radiation. White and Riesz (1968) also suggested that the technique might find study of carbon free-radicals that form on exposure of dry proteins to ionizing a more convenient means of creating a free-radical population similar to that found after gamma irradiation.

The lyophilized protein samples were exposed to an electrical discharge from The chromatography of tritiated lysozyme prepared ther, the results indicate that tritium is attached to a form of lysozyme that resembles the native protein. The authors point out that much work remains to be carried out to establish conclusively the extent of heterogeneity of protein a Tesla coil and subsequently exposed to tritiated hydrogen sulfide. Lysozyme by electrical discharge is similar to that prepared by gamma irradiation. was tritiated in this manner. tritiated by either material. [2 figures, 12 references]

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12 PAGE 23 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

(Chemical Research Department, Hoffmann-La Roche, Nutley, New c. Bauernfeind, J. 5.4 (9.14, 1.37)

No. 34, 32-34 (August 23, 1969) Feedstuffs 41,

factor in the processes and maintenance of normal metabolism. In this article, the author discusses the many biochemical and physiological roles in which biotin functions, the mechanism of its action, its inactivation by avidin (a proteinlike constituent of raw egg white), symptoms of blotin deficiency in a number of animals (including trout), and the biotin content of some two dozen feed ingredients Biotin, also known as vitamin H (hexahydro-2-oxo-1H-thieno-(3,4)-imidazole-4valeric acid), is a member of the vitamin B family. As such, it is an essential herring, menhaden, and South American fish meal; and fish soluif they are present in feed ingredients, adequate biotin levels can be achieved in feedstuffs by selection of natural ingredients containing biologically available biotin or by addition of chemically synthesized biotin. bles). Although biotin antimetabolites can bring about a dietary insufficiency L. Baldwin] [Abstracter: [4 tables, 18 references] (including hake,

Chemical Abstracts 70, No. 8, 30299s (February 24, 1969) Jurriens, G. (Unilever Res. Lab., Vlaardingen, Netherlands)

OF NATURAL OILS AND FATS ANALYSIS OF GLYCERIDES AND COMPOSITION

### TOWARD A NATIONAL SYSTEMS RESOURCE IN TOXICOLOGY

Rice, Charles N. (Specialized Information Services, National Library of Medicine, Bethesda, Maryland 20014)

Journal of Chemical Documentation 9, No. 3, 181-183 (August 1969)

(Presented in the Symposium on "Existing Toxicological Information Centers," Division of Chemical Literature, 156th Annual Meeting, American Chemical Society, Atlantic City, New Jersey, September 9, 1968.)

recognized, accepted, authoritative, and responsive national center for access to information in toxicology and for information important to toxicologists and Acting upon the President's directive, the Public Health Service of the Department of Realth, Education and Welfare plans to establish a computer-based fa-Promoting greater utilization of, toxicology infor-F. T. Piskur] cility to serve as a focal point for a network of information centers assuring The objective of the Toxicology Information Program is to become the [Abstracter: greater accessibility to, and other health professionals. mation.

This apparatus is designed to handle and freeze meat and fish, particularly fish fillets, automatically. The fish are delivered at the plant into tubes and are frozen as they pass down the tubes; thus delays and deterioration during handling are eliminated. [Abstracter: L. Baldwin J

Modern Refrigeration and Air Conditioning 72, The Gorton Corp., Gloucester, Mass. (pat.) British Patent 1,145,628 No. 857, 67 (August 1969)

7.51

A NEW BIOLOGICAL METHOD FOR ESTIMATING FOOD PROTEIN

Mokady, Shoshana, S. Viola, and G. Zimmermann (Department of Food and Bio-Technology, Technion, Israel Institute of Technology, Haifa, Israel)
British Journal of Nutrition 23, No. 3, 491-495 (August 1969)

The authors propose in this paper a new short method for estimating the nutritive value of food protein.

that expresses the amount of food nitrogen retained in the liver as a percentage or supplemented with amino acids) -- were tested for LPU and NPU on groups of six nitrogen consumption for maintenance. Thirteen samples from five foods--casein soybean protein isolate, maize gluten, wheat gluten, and cottonseed meal (alone The new method is analogous to the conventional procedure for determination posed method employs a new criterion--the protein utilized by the liver (LPU)-of the food nitrogen intake. A control group of rats is used to determine the rats. The correlation coefficient between values for LPU and NPU for all 78 of net protein utilization (NPU). Rats are used as the test animals.

Abstracter: F. T. rats was +0.85 and was considered highly significant.
[1 figure, 1 table, 19 references] Chemical Abstracts 70, No. 24, 109153y (June 16, 1969) Tohoku Yakult Seizo K.K. (pat.) British Patent 1,141,821

FROM GREEN ALGAE EXTRACTION OF AN ACTIVE POLYSACCHARIDE, FOR STIMULATING THE FUNCTION OF THE RETICULOENDOTHELIAL SYSTEM,

DETERMINATION OF NITRITE AND NITRATE IN SOME HORTICULTURAL AND MEAT PRODUCTS AND IN SAMPLES OF SOIL

Adriaanse, A., and J. E. Robbers (Sprenger Institute for Research on Storage and Journal of the Science of Food and Agriculture 20, No. 6, 321-325 (June 1969) Processing of Horticultural Produce, Wageningen, The Netherlands)

method is that the coupling product is intensely red; thus spectrophotometric measurements can be made with a comparatively high degree of accuracy. To prevent interference from ascorbic acid, the authors treated the initial material with ac-Most methods of determining nitrite ions use carcinogenic 1-naphthylamine as a reagent. Because the carcinogenic action of arylamines is eliminated when sulfonic acid groups are introduced, the authors substituted Cleve's acid 1-7 (1tive carbon, which removes ascorbic acid quantitatively without causing any loss of nitrite. Nitrate was then reduced to nitrite in a cadmium reducing column. Added Fe<sup>2+</sup>, Fe<sup>3+</sup>, Sb<sup>5+</sup>, Ag<sup>+</sup>, Hg<sup>2+</sup>, Sn<sup>2+</sup>, and SO<sub>3</sub><sup>2-</sup> did not affect the determination; however, if homogenized samples stand at 20° C. for more than a few hours, The method gave good results on soil samnaphthylamine-7-sulfonic acid) for 1-naphthylamine. An added advantage of this [Abstracter: L. ples, fruit juices, three vegetables, and minced meat. the nitrite content will be too high. [8 tables, 9 references]

Chemical Abstracts 70, No. 10, 39081x (March 10, 1969) Myklestad, Sverre (pat.)
Norsk Institutt for Tang-of Tareforskning Norwegian Patent 111,426

REFRIGERATION APPARATUS

ALGINATES PREPARATION FROM ASCOPHYLLUM

### DRAINED WEIGHT DETERMINATION OF FROZEN ALASKA KING CRABMEAT

(Food and Drug Administration, 909 First Avenue, Seattle, Wash-Miller, George A.

Journal of the Association of Official Analytical Chemists 52, No. 4, 692-695 (July 1969)

This was a collaborative study of two proposed methods for determining the

the method for drained weight of frozen shrimp by Werren and Weik (1967) adapted drained weight of frozen Alaska king crab meat. The first method was that proposed by the Alaska King Crab Marketing and Quality Control Board; the second,

Authentic packs of frozen, unglazed king crab meat representing three pack-ing methods were prepared. The packs were analyzed by the two methods by 10 collaborators. Drained-weight recovery by the Alaska King Crab Board method was 96.2±3.3 percent; recovery by the Werren and Weik method was 94.6±2.4 percent. The author recommended that a similar drained-weight study be conducted on frozen Alaska king crab meat with added "flood water" and glaze and the results compared with those of the present study. Such information will serve as a basis for further recommended action on the methods.

[2 tables, 5 reterences]

[Abstracter: F. T. Piskur]

commercial fisheries abstracts  $\,$  vol  $22\,$  no  $\,12\,$  page  $25\,$  united states department of the interior fish and wildlife service

#### COLLABORATIVE STUDY OF A RAPID ELECTROPHORETIC METHOD FOR FISH SPECIES IDENTIFICATION (7.86)

Learson, Robert J. (Technological Laboratory, U.S. Fish and Wildlife Service, Bu-Journal of the Association of Official Analytical Chemists 52, No. 4, 703-707 reau of Commercial Fisheries, Gloucester, Massachusetts 01930)

The purpose was to study, collaboratively, a proposed rapid electrophoretic method (using cellulose acceate as the supporting medium) for identifying species of fish. In this test the authentic fish samples were replaced with photographs of standard protein patterns from mathematics.

from the set of photographs representing standard protein patterns from nine spe-The analysts, Six "unknown" samples of fish were sent to 12 collaborators. The analysts, using the proposed electrophoretic method, were to identify the various species cies of fish,

of the "unknown" species from the photographic standards was extremely users. The analysts were able to match duplicate samples with an accuracy of 90 percent, but were able to correctly identify only 39 percent of the unkown samples. The Ten collaborators reported (two did not report) that correct identification author suggests that authentic samples are required for positive identification and that the method be subjected to further collaborative study using authentic

[5 figures, 2 tables, 2 references]

25 SERVICE

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12 PAGE UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE

F. T. Piskur] [Abstracter:

STARCH GEL ELECTROPHORESIS OF CRAB HAEMOCYANINS

and Terushige Motchiro (Laboratory of Marine Food Technology, Faculty of Fisheries, Hokkaido University, Hakodate, Japan) Inoue, Norio,

6, 559-561 (June No. Bulletin of the Japanese Society of Scientific Fisheries 35, 1969)

Hokkaido, the authors analyzed the electrophoretic patterns of the hemocyanins of king crab (Paralithodes camtschaticus), horse-hair crab (Erimacrus isenbeckii), and "zuwai-gani" crab (Chionoecetes opilio). The hemocyanins of king crab had three components, those of horse-hair crab had four, and those of zuwai-gani crab The patterns given In 1963, Manwell and Baker reported that the starch gel electrophoretic patterize the various species. To classify some of the crabs living in waters near terns given by the hemocyanins of marine invertebrates could be used to charac-In contrast, the hemocyanin of zuwai-gani crab gave a pattern in which the four and horse-hair crab hemocyanin was much less mobile than the other components. had five. The dominant component in the electrophoretic pattern of both king L. Baldwin] by the hemocyanin of horse-hair crab were not distinguishable by sex. [1 figure, 1 table, 4 references] major components were faster than the single minor component.

Nicol, Joseph A. C., and Chase Van Baalen (Univ. of Texas, Port Aransas) Chemical Abstracts  $\underline{70}$ , No. 13, 55220x (March 31, 1969)

REFLECTING LAYERS OF FISHES

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO 12 PAGE 25 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

#### METABOLISM OF PYRUVATE AND GLYOXYLATE BY EGGS OF SALMON (SALMO SALAR)

1, 259-264 (April 1969) (Pergamon Mounib, M. S., and J. S. Eisan (Fisheries Research Board of Canada Halifax Lab-No. Comparative Biochemistry and Physiology 29, oratory, Halifax, Nova Scotia) Press, New York, N.Y.)

sperm are able to incorporate pyruvate, acetate, and glyoxylate into their lipids. Mounib (1967) showed that when sperm of cod (Gadus morhua) or salmon (Salmo salar) are incubated with pyruvate, at least three reactions take place: (1) reduction to lactate, (2) oxidative decarboxylation of pyruvate, and (3) fixation of CO<sub>2</sub> with pyruvate. Mounib and Eisan (1966 and 1968) demonstrated that salmon The purpose of the present study was to examine the metabolism in salmon eggs of pyruvate and glyoxylate labeled with  $^{14}\mathrm{C}$  in different positions.

The results indicated that salmon eggs were able to fix carbon dioxide with pyruvate and that they metabolized glyoxylate via the glycerate pathway. The formation of  $^{14}\mathrm{C-amino}$  acids from the  $^{14}\mathrm{C-pyruvate}$  and  $^{14}\mathrm{C-glyoxylate}$  indicated F. T. [Abstracter: the presence of an active transaminase system in salmon eggs. [4 tables, 16 references]

COMMERCIAL FISHERIES ABSTRACTS VOL. 22 NO. 12 PAGE 25 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

7.9  KEY TO THE IDENTIFICATION OF CANNED SALMON SPECIES  BY SCALE CHARACTERISTICS  Newton, Richard T., and James L. Burnett (Food and Drug Administration, 909 First  Avenue, Seattle, Washington 98104)  Journal of the Association of Official Analytical Chemists 52, No. 4, 696-702  (July 1969)  The purpose of this study was to develop a simple method to distinguish the	9.15  (9.19)  OF P. P. DDT, DIELDRIN AND LINDANE; THEIR TISSUE DISTRIBUTION AND ELIMINATION RATE  Gakstatter, J. H.  Diss. Abstr., B. 27, 3820 (1967)  Journal of the Science of Food and Agriculture 20, No. 6, 1-437 (June 1969)  DDT, dieldrin, and lindane, all 14C-labeled insecticides, were added in sub-
five species of salmom in the canned product. The authors studied the characteristics of the patterns of the scales of the salmon. Salmon are usually canned with the skin on so that the characteristics of the scales may offer a means for identifying the fish contained in the can.  The authors developed a key based on characteristic patterns of the scales to distinguish the five species of salmon (pink, chum, king or chinook, silver or coho, and red or sockeye). The scales are removed from the fish skin, examined under the microscope, and compared with the key to the scales of the various species. The method appears reliable, and the authors suggest that the method be subject to collaborative study.  [6 figures, 3 references]	per liter of water into which four species of fish (1 gram of fish per liter of water) had been placed. After recovery periods of up to 41 days, the rate at which the insecticides had been taken up from the water was determined by analysis of residues in the various fish tissues: DDT > dieldrin > lindane.  The insecticides were distributed in various proportions among all the tissues, but concentration was greatest in visceral fat; it was least in muscles. High concentrations in the liver, gallbladder, pyloric ceca, and intestines were attributed to these organs' being in the route of excretion. Rates of excretion during recovery varied—more than 90 percent of the lindane was eliminated after 2 days and more than 90 percent of the dieldrin after 16 days, but about 50 percent of the DDI was still present after 32 days. All the insecticides were readily transferred from the contaminated fish to uncontaminated fish newly introduced to the recovery water.  [Abstracter: L. Baldwin]
Lisovskaya, V. I., and T. A. Petkevich (Odessa Otd. Inst. Biol. Yuzh. Morei, Odessa, U.S.S.R.) Chemical Abstracts 70, No. 7, 26666s (February 17, 1969)	, Geoffrey W
8.0 BIOCHEMICAL COMPOSITION OF THE MUSCLES OF SOME BLACK SEA FISH	9.19 ABSORPTION OF ZINC AND OTHER METALS BY THE BROWN SEAWEED (6.32) LAMINARIA DIGITATA
7.593 CONFIRMATION OF CARNOSINE AND ITS METHYLATED COMPOUNDS IN THE MUSCLES OF SOME ANIMALS	9.14 WATER-SOLUBLE VITAMIN REQUIREMENTS OF CARPVI. (5.2) REQUIREMENT FOR THIAMINE AND EFFECTS OF ANTITHIAMINES
Suyama, Michizo, and Michie Maruyama (Tokyo University of Fisheries, Konan, Minato- ku, Tokyo, Japan) Bulletin of the Japanese Society of Scientific Fisheries 35, No. 5, 471-478 (May 1969)	mo (Central Irumagun Sa sawa, Itaba
The authors undertook to identify the main imidazole dipeptide in the muscles of dolphin (Delphinus delphis), biggye tuna (Parathunus mebachi), sei whale (Ballaenoptera borealis), and snakes (Natrix tigring and Elaphe quadrivitgata). The	Bulletin of the Japanese Society of Scientific Fisheries 35, No. 5, 459-465 (May 1969)  The requirement of warm-blooded animals for thismine is closely related to
carnosine (8-alanylhistidine) and anserine (8-alanyl-1-methylhistidine) preparations obtained from snake and dolphin extracts by the procedure of Nakai et al. (1964) and from dolphin extracts obtained by the method of Tsunoo et al. (1966) had the same infrared absorption spectra as did the ophidine (8-alanyl-2-methyl-hastidine) found in three species of dolphin by Tsunoo et al. (1966). The authors	the level of carbohydrate in the diet. Using the carbohydrate-rich test diet devised by Halver and Coates (1957) for estimating the carbohydrate requirements of chinook salmon, the authors added antithiamines (amprolium, pyrithiamine, or oxythiamine) to ensure the appearance of deficiency symptoms and fed variations of the
8-slanyl-2-methylhistidine in the muscles of snak tain, on the basis of nuclear magnetic resonance sp ted as ophidine is identical with balenine (6-alan	thismine-deficient diets supplemented with thismine and/or amprolium.  After 11 weeks on the test diet, the young carp exhibited loss of appetite, fading of body color, congestion of the fins, and ecchymotic characteristics of
21 references	caused nervousness and loss of appetite and slightly retarded the carps' growth;
Noren, Koldu, and Gunnel Westoo (Nat. Inst. Public Health, Stockholm, Sweden) Chemical Abstracts 70, No. 7, 27683g (February 17, 1969)	toms completely disappeared when thiamine was added to the diet. The carp with- stood the thiamine-deficient diets and those supplemented with amprolium far
7.9  DETERMINATION OF SOME CHLORINATED PESTICIDES IN VEGETABLE OILS,  MARGARINE, BUTTER, MILK, EGGS, MEAT, AND FISH BY GAS CHROMATOGRAPHY AND THIN-LAYER CHROMATOGRAPHY	Jonger Lian did rainow troue and chickens. Thus the authors conclude that the 0.15 mg. of thiamine per kg. of body weight per day required by trout (Leitritz, 1959) is unnecessarily high for carp.  [3 figures, 2 tables, 17 references]  [Abstracter: L. Baldwin]

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